JOURNAL

DEC 10

VOLUME 8 NUMBER 9 • NOVEMBER, 1952

EAST ENGINEERING

BUNKER HILL MONUMENT

OLD STATE HOUSE

PAUL REVERE

BOSTON

CONVENTION CITY 1953

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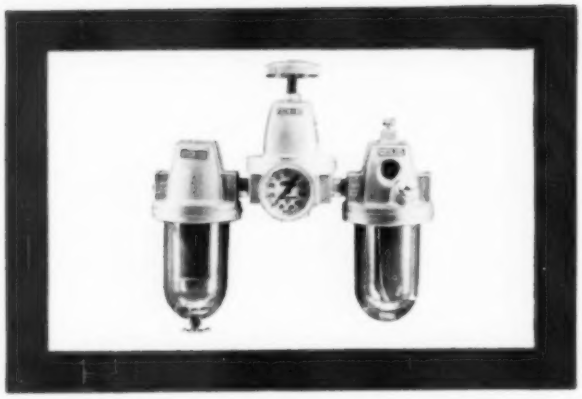
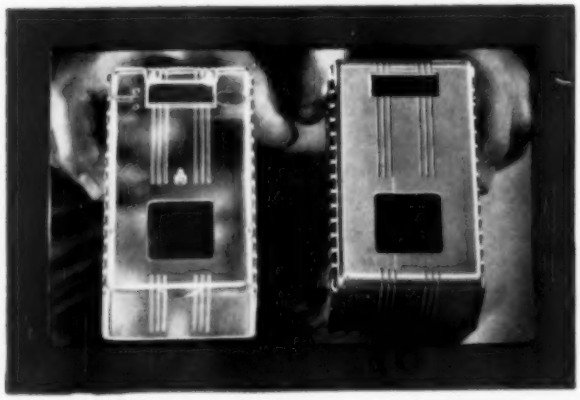
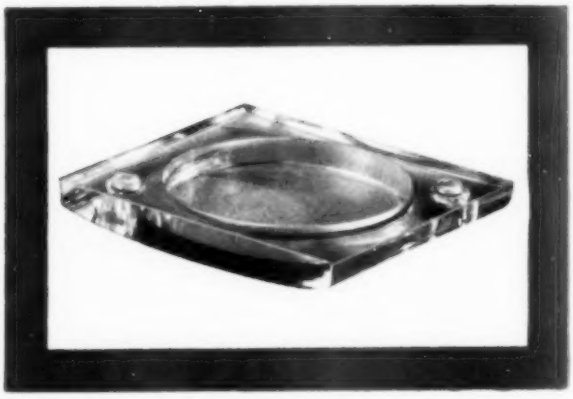


The Hannifin "Air Warden" filter-regulator-lubricator for air-driven equipment has bowls of tough, transparent BAKELITE C-11 plastic. One holds water with impurities collected from the air. The other, lubricating oil for atomizing into air stream. They withstand temperatures up to 125° F., air pressure of 150 psi. **Molded by E. Mills Corp., Chicago, Ill., for Hannifin Corp., Chicago, Ill.**

These sturdy, colorful dishes molded of BAKELITE C-11 plastics are light in weight, low in cost. They resist breakage, staining, attack by foods, soaps and detergents. **Made by Gits Molding Corporation, Chicago, Ill.**



Thermostat housings, injection-molded of BAKELITE C-11 plastic, have good detail, impact strength, smooth finish. Easily spray-coated with metallic paint. Easy moldability reduces production cost and mold maintenance. **Made by Minneapolis-Honeywell Regulator Co., Minneapolis, Minn.**



This transparent protective cover used on levels made by the Empire Level Mfg. Co. is BAKELITE C-11 plastic. It provides a neat, attractive appearance, high mechanical strength, less chance of breakage if dropped. **Made by National Lock Co., Rockford, Ill., for Empire Level Mfg. Co., Milwaukee, Wis.**

C-11 plastics present
New fields for improved product design

BAKELITE C-11 acrylonitrile-styrene copolymers fill a void in the plastic material structure. They offer you a range of new properties, new uses, new service records not obtainable with other types of plastics.

BAKELITE C-11 materials resemble both acrylic and styrene plastics in some respects, yet have distinct advantages over both. Their chemical resistance is excellent. They withstand contact with soaps, detergents, oils, food chemicals, coffee, tea, citrus peels, and cosmetics. Tensile and flexural strengths are 45% higher than those of standard polystyrenes.

In addition to the applications illustrated, C-11 materials are employed for high-quality drafting instruments requiring dimensional stability. Other uses include containers and closures for the packaging of products made with essential oils mixed with non-volatile diluents.

Possessing good color, clarity, and lightness in weight, BAKELITE C-11 plastics present opportunities for many new applications in widely varied fields. For more information, write Dept. EP-43.

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TRADE-MARK
C-11 PLASTICS

TRADE MARK

BAKELITE COMPANY
A Division of
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The Society of Plastics Engineers Journal is not responsible for the views expressed by individual contributors. Copy for each issue should be received at Security Bank Bldg., Athens, Ohio, before the fifth of each month.

TENTATIVE PROGRAM SCHEDULE
Ninth Annual Technical Conference

January 21, 22, 23rd, 1953

WEDNESDAY—JANUARY 21st.

1:00-1:45 p.m.
Annual Business Meeting of SPE Members

2:00-3:15 p.m.
Session "A"—SPE Education Forum
Moderator: Dr. James M. Church, Columbia University
Session "B"—
Moderator: Mr. Edward W. Vaill, Bakelite Co.
"Glass Bonded Mica"
Speaker: Mr. J. Harry DuBois, Mycalex Corp. of Am.
"Epoxy Casting Materials"
Speaker: Mr. Clinton Rector, National Engineering Products, Inc.

3:30-4:45 p.m.
Session "A"—Synopsis of SPE Prize Papers
Moderator: Mr. Robert C. Davenport, Gregstrom Corp.
Session "B"—
Moderator: Mr. Edmund S. Childs, Monsanto Chemical Co.
"Plating and Lacquering Plastics"
Speaker: Dr. Harold Narcus, Electrochemical Industries
"Biaxially Oriented Polystyrene and Methyl Methacrylate"
Speaker: Mr. C. Paul Fortner, Plax Corp.

THURSDAY—JANUARY 22nd.

9:00-12:00 noon
Session "A"
Moderator: Mr. John Mallory, Parker Stamp Works
"Mold Design and Standardization"
Speaker: Mr. Rene Magnenat, Waterbury Companies, Inc.
"Large Mold Construction"
Speaker: Mr. L. T. Raymond, Major Mold & Die Co.
"Tomorrow's Roll Surface Temperature Control and New Press Heating Systems"
Speaker: Mr. P. L. Geiringer, American Hydrotherm Corp.
"Polystyrene—Twenty-five Years of Progress"
Speaker: Mr. A. J. Warner, Federal Telecommunications Laboratories

9:00-12:00 noon
Session "B"
Moderator: Mr. George S. Laaff, The Bolta Co.
"Thermoplastic Sheet Application"
Speaker: Mr. Wesley Larson, DeBell & Richardson, Inc.
"The Vacuum Forming Picture"
Speaker: Mr. R. L. Butzko, Noma Electric Corp.
Mr. E. B. Stratton, Jr., Industrial Radiant Heat Co.
"Plastics Engineered for Relief Map Reproduction"

POSITION OPEN

ELECTRONIC WELDING SUPERINTENDENT—Prominent midwest converter of plastic film requires a man experienced in managing department engaged in electronic sealing vinyl film. Person must have experience in designing and fabricating electronic sealing dies, supervising personnel operating electronic equipment, organizing production lines, and maintaining electronic equipment. In reply please send resume of experience, training and salary requirements. Reply to Box 1052, SPE JOURNAL, 513 Security Bank Building, Athens, Ohio.

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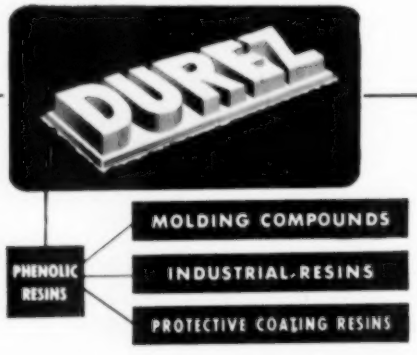

PHENOLIC PLASTICS *that fit the job*

Speaker: Mr. John Gutrowski, Dept. of the Army
"Reinforced Polyesters in Aircraft"
Speaker: Mr. Dave Birmingham, Colt's Mfg. Co.

2:00-4:45 p.m.
Session "A"—SPE Research Symposium
Moderator: Mr. A. J. Warner, Federal Telecommunications Laboratories
Speakers: To be announced

2:00-3:15 p.m.
Session "B"
Moderator: Mr. Charles W. Kleiderer, Arnold Brilhart, Ltd
"Plastics Problems in Electrical Motors & Generators"
Speaker: Mr. O. Wulfert, Wagner Electric Corp.
"Techniques of Injection and Compression Moldings of Poly-fluorocarbons"
Speaker: Mr. C. R. Giannotta, M. W. Kellogg Co.

3:30-4:45 p.m.
Session "B"
Moderator: Dr. Albert Dietz, Mass. Inst. of Technology
"Plastics for Surgeons"
Speaker: Mr. Albert Lightbody, U. S. Naval Ordnance Laboratories
"Vinyl Floor Covering Development"
Speaker: Mr. R. K. Petry, Delaware Floor Products

6:30 p.m.
Banquet
Speaker: The Countess Maria Pulaski
Dinner Music and Dancing

FRIDAY—JANUARY 23rd.

9:00-10:15 a.m.
Session "A"
Moderator: Mr. Islyn Thomas, Newark Die Co.
"Mold Castings"
Speaker: Mr. Gregory J. Azarian, American Brake Shoe Co.
"Colored Movies on Polishing & Plating of Plastic Molds"
Speaker: Mr. Arthur W. Logozzo, Nutmeg Chrome Co.

9:00-10:15 a.m.
Session "B"
Moderator: Mr. Frank A. Rideout, Bakelite Co.
"Vinyl Compounding"
Speaker: Mr. M. S. Greenhalgh, General Electric Co.
"Engineering of Rubber-Phenolics"
Speaker: Mr. A. P. Landall, General Electric Co.

10:30-12:00 noon
Session "A"—SPE Professional Activities Committee
Corp.
Moderator: Mr. Walter F. Oelman, Standard Molding
Speakers: Papers or reports by each area to be announced
(One paper to be: "Basic Facts on Plunger and Transfer Molding")
by: Sanford E. Glick, Monsanto Chemical Co.
Frank J. Donohue, Monsanto Chemical Co.
Edward W. Vaill, Bakelite Co.
Edward F. Borro, Durez Plas. & Chem. Inc.

10:30-12:00 noon
Session "B"
Moderator: Mr. Sherwood L. Young, C. F. Church Co.
"Use of Plastics in Business Machines"
Speaker: Mr. Frank W. Reynolds, International Business Machine

(continued on page 16)

Management Looks at the SPE

S. D. Hiltebrant

General Industries, Inc., Elyria, Ohio

The Society of Plastics Engineers has in the 10 brief years since its founding grown from a small group of Plastics Representatives socially inclined into a National Organization of over 2600 Plastics Engineers. This in itself stands as testimony to the need for an Engineering organization in plastics. The rapid growth of the Society parallels the growth of the industry and proves that the industry's members are seeking plastic knowledge such as that disseminated through The Journal, the sectional meetings, and the annual conferences of the Society.

Because of the widespread growth of plastics since the close of World War II there has developed an acute shortage of experienced personnel educated in the engineering of plastics. This shortage can only be overcome through an intensified program of instruction in the Colleges and among workers in the industry.

It is the SPE's duty and obligation to provide this training program and to spearhead the movement which will alleviate this shortage. Its members have the necessary background and experience to provide the teaching staff, and the know how to prepare the textbooks. The future of the SPE lies in this direction as it is only through experienced and educated personnel that the plastics industry can create the new applications which will broaden and insure its future.

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SPE JOURNAL • Volume 8 • Number 9 • November, 1952

THE *Injection* MOLDERSCOPE

By A. R. Morse

President, Injection Molder's Supply Co.

BAKELITE C-11

One of the newest thermoplastics out is Bakelite's C-11, a modified styrene copolymer. This material is really tough, really remarkable in its ability to stand heat, to resist scratching. BUT—the injection molder is going to have to prepare himself for one unescapable technological fact. As our thermoplastics are constantly improved (that means substantially one thing—made more able to resist deformation at higher heats) the point at which they will mold, and the point at which they break down chemically (burn) come always closer together. In nylon we have had a taste of this, in Bakelite C-11 we get it with a vengeance because the applications demand larger shots. In nylon most injection molded parts have been small, and the shots seldom if ever taxed the injection machine's ability to safely melt the powder. In styrene the sky's the limit, except in the case of C-11 for one thing: lack of SAFE melting capacity in the conventional machine. In a popular 8 ounce machine you can only shoot a 2 ounce shot without burning the powder! The only immediate and economical answer is in the addition of extra, safe plasticizing capacity in the form of a longer heating cylinder. In several very interesting cases this has now been very definitely proven, and the progressive molder will do well to figure his C-11 jobs in the light of the revised ratings, where his original press rating is reduced 66-75%! In order to mold an 8 oz. shot of C-11, the molder is compelled to put not a 14, but a 24 ounce heater on an 8 ounce machine, in order to gain enough heat and melting time to mold an 8 oz. shot safely. The conversion of the press to the larger heater quickly pays for itself, not only on the C-11 job, but on other work as well.

(It perhaps should be observed that the 24 oz. 17,000 watt cylinders referred to were designed along rather radical lines internally in an effort to drive as much heat as possible into the material before it struck the spreader area. It is not known at this writing if a conventionally designed 24 oz. heater will definitely handle the same 8 oz. shot referred to, as these cylinders are made specially for C-11, and specially to fit an 8 oz. press.)

At any rate, DERATING is here today, and the injection molder who is aware of it will figure his jobs using the tough new modified styrene copolymers like Bakelite's C-11 at just about ⅓ to ¼ of the original or advertised rating of his injection machine. This is a small price to pay, however, for a thermoplastic with the heat resistant properties of C-11!

Another factor must be reckoned with too—the molding range of these new copolymers is very small. From 5 to 10 degrees of heat as shown on the cylinder pyrometers will serve to overheat and degrade the powder, causing discoloration and embrittlement. The molding point is now so close to the point of chemical decomposition that we may well be forced to review our system of heat control. Indeed, the 24 oz. cylinders referred to above, have a special thermocouple well location only ¼" deep in an effort to give a more sensitive balance between recorded heat and actual heat of the molding material.

The possibilities of combinations of styrene with itself, (if we may use a plebian term) and with other compatible materials are almost infinite due to the flexible nature of the styrene molecule. But as the chemists work their miracles with styrene, each radical modification is going to produce a material that will require special consideration by the injection molder. The days are gone when you could just throw some "any old powder" in your press and mold a shot according to the press maker's rating. Today the injection molder MUST know what he is doing or he is going to get into trouble from which it may not be possible to extricate himself without incurring a financial jolt of some proportions, as well as losing irreplaceable customer goodwill.

It will pay the molder to study the molding characteristics of the modified styrenes and to plan well ahead for molding them. If you stumble into a job using a really world-beating powder like C-11, it will be worthwhile to know that your presses will be derated up to 75% before you make committments you may not be able to fill with existing (outdated) injection machines.

Fortunately, the price of this progress is relatively small, for existing presses can be stepped up to overcome the derating of modified styrenes by correct heating cylinder designs. But next time it may not be so easy.

In the race between improvements in materials by the powder suppliers and in improvements in injection machines, the machinery people caught up with the powder people in the period '48-'50. During '51 and '52 the race has been about neck and neck. Now, however, the powder people with their modified high heat resistant styrene copolymers are again definitely in the lead just as they were in 1945—only this time they are so far ahead of the press maker that the molder is going to be in hot water for a good long period. Competition is keener, however, now than it was in 1946, and already certain machines like the Impco HA 4-175 are in use which can actually meet this derating problem. The Impco 4 oz. heater is 3 times the size of many 8-9 oz. heaters, and will handle 3-4 oz. of modified styrene with ease.

What of preplasticizing units in connection with these materials? Unfortunately they are not nearly as suitable an answer as correct heater design because of the temperature control and time—temperature problem. Indeed, I suspect that the not too distant future will see thermosetting type styrene copolymers used in injection work where the **time** of exposure to heat must be regulated closer and closer. So for the present at least, the present modified styrenes do not lend themselves as readily to preplastifying units as they do to single stage heaters where the application of heat can be very closely regulated. These materials are tougher to mold in so many different ways that for the time being we should learn to handle them in one stage before we project two! The type of preplasticizing that occurs in a preplasticizer is not sensitive enough, in my opinion, to handle a material that has a demonstrated margin of only 5-10° between molding and burning—and some molders are going to run up a good deal of costly scrap before they admit that the best answer lies in revision of our concepts of cylinder design!

EFFECTS OF HUMIDITY DURING FABRICATION

John E. Wier, Dorothy C. Pons and Benjamin M. Axilrod

National Bureau of Standards

SUMMARY

The effects of humidity during fabric conditioning and during fabrication upon some physical properties of laminates prepared with glass-fabric, Fiberglas 181-114, and an unsaturated-polyester resin, Laminac 4126, were investigated.

Relative humidity during fabric conditioning and during fabrication was varied from about 4 to 95 percent. Molding pressures were 0.7 and 2.0 psi. The molding temperature recommended by the manufacturer was 220° to 250°F. Preliminary experiments showed the following to be the best times for the temperatures used: For 250°F, 2 hours; for 220°F, 3 hours; and for 160°F, 48 hours.

Tests on these laminates included the measurement of flexural strength on the diagonal, both dry and after 7 days' immersion in water, specific gravity, resin content, percentage of voids, and total light transmission. Some data were also taken on lengthwise flexural strength.

The effects of humidity during fabrication on flexural strength, both wet and dry, and on specific gravity, percentage of voids, and light transmission were pronounced when molding temperatures of 220° and 250°F were used. At a molding temperature of 160°F these effects were negligible.

An increase in the humidity during fabrication decreased the flexural strength, the resin content, the specific gravity, and the light transmission and increased the percentage of voids in laminates molded at 220° and 250°F. For example, when the relative humidity was increased from about 5 to 50 percent during resin coating, the flexural strengths, lengthwise and diagonal and wet or dry, decreased about 15 to 20 percent for laminates made using the 220°F cure and about 35 to 40 percent for the 250°F cure.

Differences in the properties of laminates made of fabric which was dried over silica gel and those made of fabric which was oven-dried were negligible.

A relationship was shown to exist between flexural strength and the percentage of voids, and between the percentage of voids and light transmission.

The data obtained on panels molded at the 10 different molding cycles used to determine suitable curing cycles are shown in table I.

The results of tests obtained on panels made at the five different humidity conditions and molded at three molding cycles are shown in tables II and III.

Effects of Molding Cycle

The statistical analysis of the flexural-strength data, on panels molded at 10 different combinations of time and temperature indicates that panels molded for 2 hours at 250°F, for 3 hours at 220°F, and for 48 hours at 160°F had equal or higher dry strengths than panels molded for shorter and longer periods of time at these temperatures. Accordingly these cure cycles were selected for the subsequent experiments on the effects of humidity during fabrication.

It is noted that panels molded at 265°F for 1 hour were significantly lower in strength than panels molded at any of the other nine molding conditions. Laminates molded at 160°F for 48 hours with an additional cure of 2 hours at 250°F did not differ significantly in strength from those molded at 160° F for 48 hours with no additional cure.

Data on the other properties of these laminates (table I) reveal no differences in values which would affect the selection of the molding cycles to be used for the study of the effects of humidity.

Values of other properties of panels molded at the three cycles selected as suitable are incorporated into tables II and III. Discussion of these properties of the panels is included in the effects of humidity on each of the various properties.

Effects of Humidity During Fabrication

Effects of humidity on dry flexural strength—

The essence of the flexural-strength results is as follows:

Varying the relative humid-

This article is a condensation of N.A.C.A. Research Memorandum 51-C21.

OF POLYESTER LAMINATES

ity during conditioning and resin coating has no significant effect on the dry strength of panels cured at 160°F for 48 hours but has a marked effect on the strength of laminates cured at the recommended temperatures, 220° to 250°F. Thus as the relative humidity during resin coating is increased, the flexural strength is much reduced with the reduction greater for 250° than for 220°F cure.

The magnitudes of these changes for laminates made at 0.7 psi are as follows:

For the two low humidity conditions A and B, the dry flexural strengths, about 24,500 psi, do not differ significantly at 220° and 250°F but are slightly, although significantly, less than 27,500 psi, the value for the 160°F, 48-hour cure.[1] For the moderate condition C, in which the relative humidity was 50 percent during resin coating, the resulting flexural strengths for the 220° and 250° F cures, 20,500 and 17,000 psi, respectively, are already appreciably as well as significantly lower than the values for resin coating in dry air (A and B).

For cures at 220° and 250°F at the times selected, the effect of resin coating at 95-percent relative humidity as in conditions D and E is the reduction of the strength to average values of about 14,000 and 11,000 psi, respectively. It should be noted that the beneficial effect of drying the fabric over silica gel in condition D is practically nullified by the high humidity during resin coating since for conditions D and E at the 220° and 250°F cures the strengths were reduced to nearly the same level.

Since conditions A and B are quite similar and also D and E, it was decided to analyze statistically data for a pressure of 0.7 psi for the above conditions. For each molding cycle panels fabricated at condition A are not significantly different in strength from panels molded at condition B.

Panels molded at condition D do not differ significantly in strength from panels molded at condition E, at 250° and 160°F. Panels made at condition D are shown to have a significantly higher strength than those made at condition E, at 220°F. There is little, if any, logical explanation for this apparent anomaly, so it must be ascribed to chance fluctuations.

It is interesting to note that the dry flexural strengths for panels prepared at all humidity conditions and cured at 160°F for 48 hours were significantly higher (at the 99.9 percent level of confidence) than their values for other cures with any humidity condition.

Effects of humidity on wet diagonal flexural strength—

The trends for the different humidity conditions of wet strength as the molding temperature is increased are very similar to those for dry diagonal flexural strength. Likewise, the statistical grouping of the wet-strength data is similar to that for dry diagonal flexural strength. As before at the 160°F cure there is little effect from varying the humidity during fabrication, whereas for the 220° and 250°F cures the strength diminishes with increasing humidity.

The diagonal flexural strength of panels molded at 0.7-psi pressure ranged as follows:

(1) For a molding temperature of 250°F from 7200 psi at condition D to 17,900 psi in panels made at condition A.

(2) For a molding temperature of 220°F from 8900 psi in panels made at condition E to 17,100 psi in panels made at condition A.

(3) For a molding temperature of 160°F from 17,500 psi in panels made at condition D to 19,900 psi in panels made at condition A.

To summarize the effects of varying the humidity during resin coating on the dry and wet diagonal flexural strengths, these properties for conditions B, C, and D may be expressed in percent of the value at condition of B as shown in the table at the bottom of this page.

Effects of humidity on flexural strength, lengthwise — Flexural strength lengthwise was affected by humidity during fabrication in the same manner as was the flexural strength on the diagonal.

The values for lengthwise strength varied from 14,900 psi in panels made at condition E and molded at 250°F to 45,000 psi in panels made at condition A and molded at 160°F at the same pressure.

Wet flexural strength lengthwise ranged from 10,200 psi in panels made at condition D and molded at 250°F to 34,800 psi in panels made at con-

Flexural Strength Properties Depend On Humidity During Coating

Cure temperature (°F)	Condition when tested	Condition and relative humidity during coating		
		B, 5-percent relative humidity	C, 50-percent relative humidity	D, 95-percent relative humidity
		Flexural strength (percent of strength at condition B)		
250	Dry	100	66	42
	Wet	100	65	42
220	Dry	100	85	64
	Wet	100	83	55
160	Dry	100	96	93
	Wet	100	103	95

[1] *It is interesting to note that in previous work with a different polyester resin, the highest strengths were obtained with a similar long cure at 160° F in contrast with cures at the recommended temperatures which were much higher.*

dition B and molded at the same temperature.

Effects of humidity on percent loss in strength due to water immersion— The percent loss in diagonal flexural strength due to water immersion ranged from 25.4 percent for panels made at condition E and molded at 250° F to 40.6 percnet in panels made at condition D and molded at 220° F.

The data show considerable scatter and no definite conclusions regarding any definite trends appear justified. An exception to this general statement occurred for panels molded at condition D at 220°F. Panels molded at this condition and temperature show a 40-percent loss in strength which is much higher than in panels made at any of the other conditions. Two panels molded at 2.0 psi exhibited similar high losses. The reason for this apparent anomaly is not clear, especially since panels fabricated at condition E, a somewhat similar condition, displayed no unduly high percent loss of strength due to water immersion.

Effects of humidity on specific gravity — For a molding pressure of 0.7 psi the specific gravity varied from 1.32 in panels made at condition D and molded at 250°F to 1.66 in panels made at condition E and molded at 160°F.

The most significant differences occurred in panels fabricated at conditions E, D, and C at temperatures of 250° and 220°F. Panels molded at these temperatures at conditions A and B, and those molded at 160°F at all five humidity conditions showed no significant differences in specific gravity.

Effects of humidity on resin content — The resin content varied from 31.1 percent in panels made at condition E and molded at 250°F to 46.0 percent in panels made at condition A and molded at 160°F.

The influence of humidity on resin content is least for cures at 160°F and greatest for cures at 250°F. Thus, while the general trend for each cure temperature is a decrease in resin content as the humidity during fabrication is increased, for cures at 160°F the resin-content values, except for condition E, did not differ significantly from one another. For cures at 250°F, however, the resin contents for conditions A, B, C, D, and E were successively lower in that order and significantly so.

Effects of humidity on voids — The effect of humidity during fabrication on the voids content is somewhat similar to that for resin content. Thus, the influence of humidity is least for cures at 160°F and greatest for cures at 250°F. The general trend for each cure temperature is an increase in voids content as the humidity during fabrication is increased. However, for cures at 160°F the values for voids content for conditions A to E do not differ significantly, the range being -0.2 to 1.2 percent.[2] For panels molded at 250°F the voids contents ranged from about 1.6 percent for conditions A and B to 25.7 percent for condition D. It is noted that the values for the voids content of the panels molded at 220° and 250°F with humidity conditions A and B were 2 percent or less and did not differ significantly from the corresponding data for panels molded at 160°F.

Panels molded at 250°F had significantly higher voids content than those molded at 220°F for the higher humidity conditions C, D, and E; for the low humidity conditions the voids values for the panels molded at 220° and 250°F did not differ significantly.

Effects of humidity on light transmission — For panels molded at 0.7 psi the light transmission increased from 1 percent in panels made at condition D and molded at 250°F to 50 percent in panels made at condition A and molded at 160°F.

Light-transmission data were gathered in the belief that the degree of translucency of a panel was an indication of the intimacy of the resin-fabric bond.

Panels made at all conditions of humidity except E, and molded at 160°F, had the highest degree of

[2]*The reason for obtaining a negative voids content in some panels is that this calculation is based on the specific gravity of the resin as obtained commercially. However, in molding the panels at a temperature of 160° F some of the styrene monomer is lost before the resin is fully cured. Since the styrene is the low-density component of the copolymer, a decrease in the styrene content of the resin will result in a copolymer of higher density than that of the original resin, as received from the manufacturer.*

TABLE I.- EFFECTS OF DIFFERENT MOLDING CYCLES ON PROPERTIES OF FIBERGLAS 181-114 LAMINATES BONDED WITH LAMINAC 4126 RESIN AT 0.7-PSI PRESSURE

Molding cycle		Diagonal flexural strength, dry (psi) (a)	Diagonal flexural strength, wet (psi) (a)	Loss in flexural strength due to water immersion (percent) (b)	Resin content (percent by weight) (c)	Specific gravity (c)	Voids (percent by volume) (c)	Light transmission (percent) (d)
Temperature (°F)	Time (hr)							
265	1	20.6×10^3	15.6×10^3	24.5	44.1	1.62	1.9	3
250	1	25.8	18.2	29.0	44.5	1.63	.7	27
	2	25.5	17.1	29.0	44.4	1.63	.7	12
	3	23.1	16.4	28.9	43.8	1.62	1.6	18
220	1.5	22.0	16.0	27.5	44.7	1.62	.9	12
	3	24.3	17.0	29.6	44.6	1.64	.5	14
	6	24.5	17.4	29.0	44.7	1.64	.2	18
160	24	24.9	18.6	25.5	44.3	1.66	-.4	52
	48	27.6	20.1	28.3	45.9	1.63	-.3	50
[e]160 - 250	[e]48 - 2	26.7	18.6	30.2	45.2	1.64	-.2	38

[a]Data based on results for 12 specimens taken equally from 2 panels.

[b]Data based on the average results for six dry and six wet specimens taken from each of two panels.

[c]Data based on results for 24 specimens taken equally from 2 panels.

[d]Data based on eight readings taken equally on two panels.

[e]Molding cycle of 160° F for 48 hr with an additional cure at 250° F for 2 hr.

TABLE II—DIAGONAL-FLEXURAL-STRENGTH PROPERTIES OF FIBERGLAS 181-114 LAMINATE BONDED WITH LAMINAC 4126 RESIN AT DIFFERENT MOLDING AND HUMIDITY CONDITIONS

Molding conditions			Humidity conditions (a)				
Pressure (psi)	Temperature (°F)	Time (hr)	A	B	C	D	E
			Flexural strength,[b] dry (psi)				
0.7	250	2	24.9×10^3	25.2×10^3	16.7×10^3	10.6×10^3	10.8×10^3
	220	3	23.5	24.0	20.5	15.4	12.0
	160	48	26.9	28.2	27.1	26.2	26.4
2.0	250	2	24.9	[c]25.7	----------	----------	----------
	220	3	25.0	[c]26.8	----------	[c]18.0	[c]13.4
	160	48	28.2	[c]30.2	----------	----------	----------
			Flexural strength,[b] wet (psi)				
0.7	250	2	17.9×10^3	17.6×10^3	11.4×10^3	7.2×10^3	8.0×10^3
	220	3	17.1	16.7	13.8	9.2	8.9
	160	48	19.9	18.5	19.0	17.5	18.3
2.0	250	2	19.0	[c]18.2	----------	----------	----------
	220	3	19.3	[c]18.6	----------	[c]10.6	[c]9.4
	160	48	21.6	[c]20.4	----------	----------	----------
			Loss in flexural strength due to water immersion,[d] (percent)				
0.7	250	2	28.1	29.9	31.6	31.9	25.4
	220	3	26.7	30.4	32.4	40.6	26.2
	160	48	25.8	33.9	29.9	32.8	29.9
2.0	250	2	23.8	[e]29.1	----	-----	-----
	220	3	22.9	[e]30.7	----	[e]41.3	[e]30.3
	160	48	23.4	[e]32.4	----	-----	-----

[a]The preconditioning of the fabric and impregnation of the fabric with resin were done under the following conditions:

Condition A: Fabric oven-dried at 135° C for at least 24 hr and impregnated at a low relative humidity, 4 to 8 percent, at room temperature

Condition B: Fabric dried over silica gel for at least 7 days and impregnated at a low relative humidity, 4 to 8 percent, at room temperature

Condition C: Fabric dried over silica gel for at least 7 days and impregnated at 45- to 50-percent relative humidity

Condition D: Fabric dried over silica gel for at least 7 days and impregnated at 95- to 100-percent relative humidity at room temperature

Condition E: Fabric conditioned and impregnated at 95-percent relative humidity at room temperature

[b]Data based on 15 specimens, 12 being taken equally from 2 panels and 3 from the third, unless otherwise specified.

[c]Data based on 12 specimens taken equally from 2 panels.

[d]Data based on the average of the three panels from which flexural strength specimens were taken, unless otherwise specified.

[e]Data based on the average of the two panels from which flexural strength specimens were taken.

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TABLE III—DENSITY AND LIGHT-TRANSMISSION PROPERTIES OF FIBERGLAS 181-114 LAMINATES BONDED WITH LAMINAC 4126 RESIN AT DIFFERENT MOLDING AND HUMIDITY CONDITIONS

Molding conditions			Humidity conditions (a)				
Pressure (psi)	Temperature (°F)	Time (hr)	A	B	C	D	E
			Specific gravity[b]				
0.7	250	2	1.62	1.64	1.50	1.32	1.44
	220	3	1.62	1.62	1.55	1.48	1.50
	160	48	1.63	1.64	1.62	1.65	1.66
2.0	250	2	1.62	[c]1.63	-----	------	------
	220	3	1.63	[c]1.64	-----	[c]1.58	[c]1.60
	160	48	1.65	[c]1.67	-----	------	------
			Resin content[b] (percent by weight)				
0.7	250	2	44.7	42.3	39.7	34.6	31.1
	220	3	45.1	44.1	44.1	37.0	34.2
	160	48	46.0	45.1	45.6	43.6	41.7
2.0	250	2	42.3	[c]42.9	-----	------	------
	220	3	42.3	[c]43.2	-----	[c]34.4	[c]30.7
	160	48	43.3	[c]42.7	-----	------	------
			Voids[b] (percent by volume)				
0.7	250	2	1.3	2.0	12.4	25.7	21.6
	220	3	2.0	1.9	5.8	15.2	16.3
	160	48	-.2	-.1	.4	.6	1.2
2.0	250	2	3.0	[c]2.0	----	-----	-----
	220	3	2.6	[c]1.2	----	[c]11.3	[c]13.4
	160	48	.6	[c]0	----	-----	-----
			Light transmission[d] (percent)				
0.7	250	2	11	11	4	1	4
	220	3	14	15	7	7	2
	160	48	50	44	40	35	14
2.0	250	2	9	[e]12	--	---	--
	220	3	10	[e]19	--	[e]10	[e]2
	160	48	47	[e]49	--	---	--

[a]The preconditioning of the fabric and impregnation of the fabric with resin were done under the following conditions:

Condition A: Fabric oven-dried at 135° C for at least 24 hr and impregnated at a low relative humidity, 4 to 8 percent, at room temperature

Condition B: Fabric dried over silica gel for at least 7 days and impregnated at a low relative humidity, 4 to 8 percent, at room temperature

Condition C: Fabric dried over silica gel for at least 7 days and impregnated at 45- to 50-percent relative humidity

Condition D: Fabric dried over silica gel for at least 7 days and impregnated at 95- to 100-percent relative humidity at room temperature

Condition E: Fabric conditioned and impregnated at 95-percent relative humidity at room temperature

[b]Data based on 36 specimens taken equally from 3 panels, unless otherwise specified.

[c]Data based on 24 specimens taken equally from 2 panels.

[d]Data based on average of 12 readings taken equally on 3 panels, unless otherwise specified.

[e]Data based on average of eight readings taken equally on two panels.

translucency. Light transmission for these panels ranged from 35 to 50 percent. Panels molded at condition E, at this temperature, had a light transmission of 14 percent.

Panels molded at 220° and 250°F ranged in light transmission from 1 to 15 percent, depending upon the humidity conditions at which they were fabricated. It is noted that for the low humidity conditions A and B, and cures at both 220° and 250°F, the light-transmission values did not differ significantly.

Relationship of wet to dry strength — It can be concluded that the wet strength of a panel is directly dependent upon its dry strength. Departures from the straight line may be explained by the fact that wet- and dry-strength data must be obtained on two different specimens and hence the ratio of the two strengths is somewhat influenced by specimen-to-specimen variability of the results. It should not be inferred that laminates made with different glass fabric, fabric finish, or resin would necessarily show this same relationship between dry and wet strength.

Relationship between voids content and flexural strength — The flexural strength of a glass-fabric laminate bonded with Laminac 4126 is definitely related to its voids content. The strength increases as the amount of voids is decreased. The existence of such a relationship emphasizes the necessity of quantitative measurement of voids in this type of laminate, and the need for developing laminating techniques which reduce the amount of voids to a minimum.

Relationship of light transmission to voids — It has been remarked in the section on the effects of humidity on light transmission, that this property is believed to be a measure of the intimacy of the resin glass-fiber bond. Since in some respects voids are also a measure of this property, it could be expected that a relationship exists between the light transmission and the amount of voids in the laminate.

CONCLUSIONS

This investigation has definitely established that several physical properties of glass-fabric laminates made of Fiberglas 181-114 and bonded with an unsaturated polyester resin, Laminac 4126, are affected by humidity during fabrication if molding is done at the recommended temperatures of 220° to 250° F. It has also been established that these effects of humidity are decreased and almost completely eliminated if molding temperatures of 160°F are employed.

Specifically, these effects can be summarized as follows:

1. At molding temperatures of 220° and 250°F an increase in humidity during fabrication and during fabric conditioning affects the finished laminate as follows:

   a. Decreases its flexural strength, both wet and dry, with a greater effect at 250°F than at 220°F. Thus, for laminates molded at 220°F with a relative humidity during fabrication of 50 percent, the flexural strength is 15 to 20 percent less than that for laminates made at 5-percent relative humidity; at 95-percent relative humidity the flexural strength is 40 to 50 percent less.

   b. Decreases its specific gravity.

   c. Decreases its resin content.

   d. Increases its voids content.

   e. Decreases its light transmission.

2. At a molding temperature of 160°F, an increase in humidity during fabrication and fabric conditioning produces little or no effect on the properties of the laminate.

This investigation has also established the existence of a relationship between the percentage of voids and the flexural strength of this type of glass fabric polyester laminate. This emphasizes the need for producing void-free laminates.

It has also been shown that the light-transmission properties of a laminate are related to the percentage of voids. From this relationship it appears that the measurement of this optical property in certain types of laminates may be useful in determining their soundness and as a measurement for quality control.

Experimental Procedure

MATERIALS

The glass fabric selected for this investigation was Fiberglas 181-114, an eight-shaft harness-weave fabric, with a water-repellent methacrylic chrome complex finish. Fiberglas 181 is identical to the one used in earlier phases of this investigation and was selected on the basis of the manufacturer's recommendation. The choice of Finish 114 was based both on the manufacturer's recommendation and on results obtained in the second phase of this investigation which dealt with the effects of fabric finishes on some physical properties of glass-fabric poyester laminates.

The resin, Laminac 4126, was selected on the basis of comparative data obtained on several polyester laminates by investigators at The Johns Hopkins University. Further investigations with Bakelite resin XRS-81, which was used in the previous phases of this work, were abandoned because of the discontinuance of its production.

The catalyst was benzoyl peroxide, Luperco ATC in paste form. This paste catalyst consists of 50 percent peroxide in tricresyl phosphate.

The cellophane used as a release agent was Sylphrap No. 600 P-1-L.

PROCEDURES AND EQUIPMENT

Fabrication of Laminates

Preparation of glass fabric — The fabric was cut into pieces 6.5 inches square. To keep the fibers of the fabric from unweaving during the impregnation process, the edges of each piece of fabric were coated with starch.

Conditioning of glass fabric — The fabric used in the experiments to determine suitable molding cycles was dried in an air-circulating oven for one hour at 275°F.

In that portion of this investigation directed at studying the effects of humidity during fabrication, the fabric conditioning included the following treatments: (a) Drying in an over for 1 hour at 275°F, the same as was done in the molding-cycle experiments, (b) drying over silica gel for a period of not less than 7 days, and (c) conditioning at 95- to 100-percent relative humidity for a period of 16 to 24 hours.

Preparation of resin — The resin, Laminac 4126, was mixed with 2 percent benzoyl peroxide, Luperco ATC, in batches of 400 to 500 grams. The mixture of resin and catalyst was stirred for a period of 20 minutes with an electrically powered propeller-type stirrer. To minimize the escape of the more volatile components of the resin, the mixing jar was covered almost completely during stirring.

Impregnation of fabric with resin— The fabric was impregnated with resin by running it through a pair of hand-operated squeeze rollers which were kept coated with resin. Each square of fabric was run between the rollers as many times as was required for the fabric to lose its opacity. Uniform translucency of the fabric was considered to be the criterion of sufficient impregnation. All resin coating was done in a controlled-humidity chamber.

Panel assembly — A small amount of resin was applied to a flat piece of cellophane. The seven squares of resin-impregnated fabric were laid up successively on this area. A small amount of additional resin was applied between plies both to insure an adequate amount of resin and to minimize entrapped air. Another piece of cellophane was placed over the top of the laminate. Air pockets were eliminated by running a spatula over the surface of the cellophane. This entire procedure was carried out in the controlled humidity chamber. All pieces of fabric were placed in the humidity chamber about 15 minutes before the resin coating process was begun. Complete assembly of the panels was accomplished in about 10 additional minutes.

After taking the cellophane-wrapped assembly out of this chamber, the ends of the cellophane sheets, which extended beyond the limits of the

(Please turn to Page 27)

LATEST DEVELOPMENTS IN AUTOMATIC MOLDING

MOST of the practical molders in any gathering, remembering $4,000—5,000 molds which have been badly damaged and production held up for days because an operator went to sleep on his feet for a split second, listen with only half an ear when someone starts talking about automatic molding. Anyone can probably think of forty-nine reasons why automatic molding can't or won't work—but there is one good, strong, and sufficient reason why it can and must work—**the profit dollar.**

Any method of molding which can increase the production per dollar of molding machine investment and reduce labor costs, is bound to have a favorable effect on the profit dollar. For this very compelling reason, we have believed that it was worth while to examine the objections to automatic molding, not for reasons why it can't be done, but as limitations to be surmounted for indications of how machines can be developed and techniques acquired to make automatic molding possible.

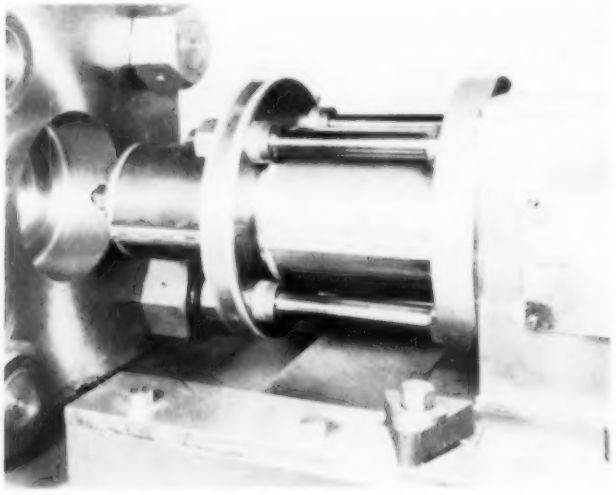
As machine manufacturers, we know that most of the developments in automatic molding depend on what the molders, as customers, do with the equipment after they get it into the plant— what ingenuity you, your tool engineers, or mold makers show in solving the multitude of problems that surround each individual injection job.

As a case in point, consider the sprue in an injection mold. Why this relic of poor plasticizing and improper nozzle design still lives on to cause sticking problems, require extra stroke length in the press and often add seconds to cycle time is a question more and more molders are beginning to ask themselves. Sketch 1 shows an extension nozzle, heat controlled, which extends to the parting line of the mold and greatly facilitates automatic molding—to say nothing of saving material. This design can be used equally well on single or double parting line molds with very little loss of effective molding area. In some cases it has also been used successfully into a single cavity where the end of the nozzle actually formed a part of the cavity. The trade mark was on the end of the nozzle. This development has been made practical by machines employing a hydraulically actuated mobile nozzle slide which carries the whole injection mechanism and heating cylinder directly to the mold.

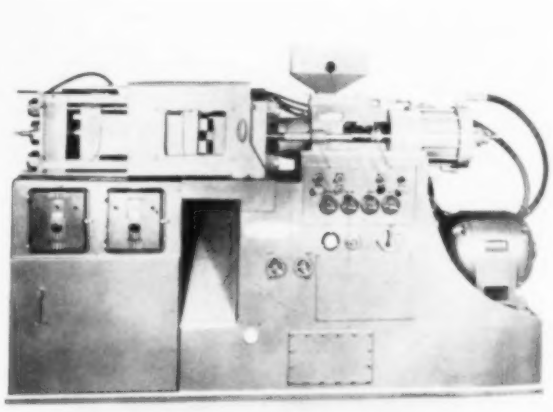
Another development which has facilitated automatic molding, particularly on materials with some flexibility, is automatic degating. In Sketch 2, are two examples of this as applied to a single parting line mold. In the first case the gate goes under the parting surface while in the second a two stage knock-out is employed, ample-knock-out travel and a fairly flexible pattern of K.O. Holes in the machine platen are of considerable assistance here.

The automatic degating possible with a multiple parting line or three plate mold is well known, but automatic operation of such molds can also be achieved by use of back gating into the cavity and combining the K.O. system with stripper action or by employing a front stripper with the special nozzle on the mobile slide mentioned in the first case.

Still another problem solved by ingenuity concerns jobs where, due to design, the shot may have a tendency to hang on the knock-out pins. Here, as illustrated in sketch 3, cam-actuated knock-out plate-stops on the machine compress springs in the mold K.O. mechanism until the very last increment of opening stroke, at which time the stops are lifted clear and the springs in the mold retract the knock-out mechanism. Auxiliary cylinders, either air or hydraulic have also been employed for this purpose.



Close view of heating cylinder on mobile nozzle slide, greatly facilitating use of special design extension nozzles.

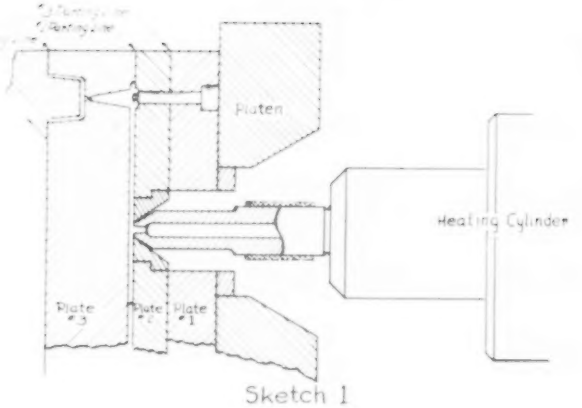


The Fellows machine such as is described producing ten shots per minute.

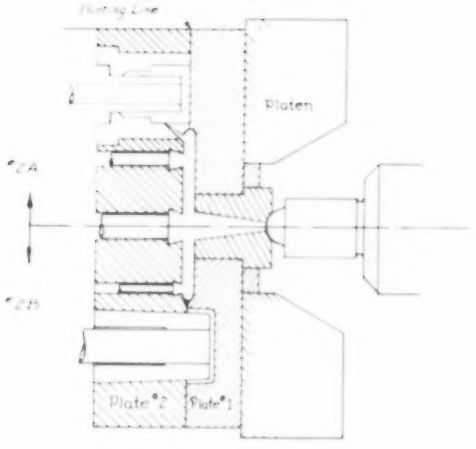
N HIGH SPEED
MACHINERY

Fred C. Means

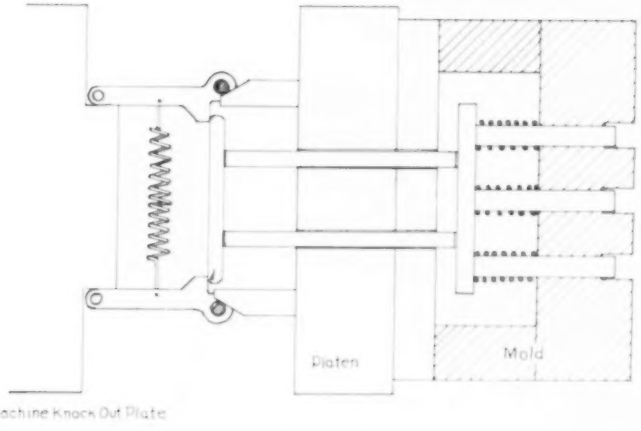
Manager, Plastics Machine Division
Fellows Gear Shaper Co.



Sketch 1



Sketch #2



Sketch #3

One of the important aspects of molding automatically, which is often overlooked, is the elimination of a variable "door-open" time which is almost impossible to completely overcome so long as the actions of an operator form a part of the cycle. You are of course well aware that injection molding is essentially a continuous process dependent for its success on the uniformity of the time, temperature and pressure variables. In addition to the time lost each cycle because of opening and closing a door, considerable variation in quality can result as regards flash, short-shots, non-uniform weight shots, etc., due to the erratic element introduced by an operator.

Accurate incremental time controllers for each element of cycle, including delay time to allow the shot to clear itself from the mold, are built into the machine and greatly facilitate the initial adjustments necessary to get the machine on cycle. Control for injection pressure, including dual-pressure injection in some cases, is also provided for. Temperature controllers built right into the machine make for quick and easy changes to this most important variable without having to move from the operating station.

To facilitate speed of clearing the shot from the mold, connections are provided for air blasts, actuated by an air valve or switch as the press opens. These same connections can be used on air lines directly to the mold in cases where the parts must be blown from the cavity.

Adequate provision for mold temperature control is, of course, a must for good automatic molding. While water and drain connections for the mold and also for cooling the front platen are provided, some form of commercial temperature controller is recommended for maintaining elevated temperatures where this is necessary.

Quite probably, as was mentioned earlier, some gentlemen are listening with half an ear, waiting for the

$64.00 question. What happens to your fancy mold when a shot gets caught between the mold halves—and no operator around?

The answer to that is—**nothing!** Even with soft steel, or "as-cast" beryllium, there will be no damage done to the mold if the machine is equipped with a low pressure closing safety device and is being run on fast automatic cycles.

In the first place, the mold faces come into contact under very low pressure until such time as a microswitch, sensitive to .005 to .010", is made, at which time the machine goes back to high pressure, the toggles straighten out and the molding cycle begins.

If a piece does get caught, it usually has sufficient heat in it to flatten out somewhat and distribute the low pressure of the initial closing stroke over a wide enough area as to be well within the compressive strength of the materials used in mold construction.

An actual job might serve to illustrate this. The shot consisted of a twelve cavity Christmas item of about .040" wall. Total weight of the shot was about 1-¼ oz. The mold was of three plate construction without a sprue. The runners were connected with thin supporting webs to keep them from curling to the point where they wouldn't drop. Actual molding time was ten shots per minute. Material was polystyrene molded at the rate of 47 pounds per hour.

Occasionally a shot would stick, but result in no damage to the die. The machine was provided with an overriding timer set for slightly longer than the full cycle. Any interruption allowed it to time out and light a signal light or ring a bell to attract the attention of operating personnel kept busy in loading hoppers, collecting and regrinding scrap and packaging.

In this case it was not necessary, due to the thin wall section, to blow the parts into a water bath to harden them. This can be, and is often done, on heavier section parts where a disproprotionate amount of the machine time would be employed in non-productive cooling.

We have run into some objection to blowing parts into water, such as water-spotting or cracking and crazing, particularly upon later applications of inks or paint. The use of a small amount of detergent appears to take care of the spotting objections but the combined efforts of ink and paint chemists have been required to run down contamination or other constituents in hard water that caused incompatability with the inks or paint. So far, as we know, this is no longer a major problem.

There are, of course, certain jobs where due to dimensional tolerances or other quality requirements, longer cycles must be run. These same machines can mold nylon gears to thousandths on a 40 second cycle or run quality control checks for one of the country's largest plastics material manufacturers in their laboratories making tensile test speciments and color and clarity chips, where as many of 40 to 50 color changes in twenty four hours are required. Obviously then there is considerable versatility retained in the machine as conventional molding can be done equally well.

Some of the latest developments in high speed automatic molding machinery are:

a) A new appreciation of and provision for high speed operations up to 10 cycles per minute.
b) More pounds of plasticized material per hour.
c) Safety and Signal Devices on the press closing stroke.
d) Mobile Nozzle Slide to permit "Sprueless Molding".
e) Air blast connections for rapid parts ejection.
f) Refinement of controls to stabilize the time, temperature and pressure variables.
g) The combination of such equipment with aggressive and ingenious tool design results in more salable merchandise produced per machine, per hour at less labor cost.

We believe these factors combine to provide for more profit-dollars to the user of such equipment. We further believe that more profit-dollars are the most convincing reasons in the world for the development and continued growth of automatic molding machinery and techniques despite the many objections which admittedly must be surmounted for successful operation.

Conference Program

(con't. from page 4)

12:00 noon

Luncheon
Feature Speaker: General G. F. Doriot, President, American Research & Development Corp.

2:00 p.m.

Open Forum
Moderator: Mr. Sherwood L. Young, C. F. Church Co.
Speakers: All speakers at the conference invited to constitute an informal panel.

INJECTION MOLDERS
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Dear Boss-
Please re-order IMS SILICONE SPRAY because it really works
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PRICES In Unbroken Dozens $18.00
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CLEVELAND 13, OHIO

Successful Designing For Plastics Molding

By W. M. Halliday

In this installment the author considers still further the design of some typical components with particular reference to the location of flutings, grooves, etc., on the side walls of the molding

VERY often the component designer will desire to incorporate flutings, grooves or similar decorative features on the sides of a component in order to enhance the external appearance of the part. The use of such features is generally likely to be very advantageous and economical for breaking excessively large and flat surface areas.

When such features have to be disposed in the manner shown at A (Fig. 1), some care will have to be taken in their selection and application in relationship to the normal parting-line plane of the mold.

The example at A, showing a very common type of hollow box molding, depicts two widely used forms of grooving or fluting. The mold parting line lies along the plane "a—a," thus ensuring that the whole of the cavity formation for producing the external shape of the part can be provided within one mold block. A stationary core plug fixed to the opposite mold block forms the internal opening in the part, the latter being extracted from the core in the usual fashion.

Located vertically upon the long front side of the component are two side grooves flat on the bottom and of considerable width. It should be noted that these grooves extend over the full height of the side right to the top face coincident with line "a—a." At the opposite long side to the left, five shallow flutings of semi-circular shape are provided, and again these forms are extended up to the top edge of the component.

The effect of grooving, etc., of this character is to form an irregular edge at the flash line, and as a result the removal of the flash material when cleaning up the component after molding will be appreciably more difficult.

Trimming of the flash would have to be performed by means of a die trimming tool, and there would be some risk of damaging the lower surfaces of the grooves or flutes, etc., in its passage through such a die. Should very thick flash occur at this point, as is likely with a compression molding, there would also be some danger of destroying the sharp edge on the perimeter of the top surface, and a very unpleasing appearance would thereby result.

The sectional illustration given at B (Fig. 1) shows a very effective modification to the original design A, which may often be adopted with excellent results for overcoming or avoiding the aforementioned snags.

With this adapted design shape it will be noted that a beading has been provided at the top edge of the molded article, this beading being situated as a slight projection on the external sides. The grooving and flutes are carried up to the under side of the beading as indicated. The mold parting-line surface coincides with the plane "a—a," as before.

The introduction of a simple beading of this character will be very convenient as far as mold construction is concerned, the only additional machining being entailed is that of enlarging the mouth of the cavity on all four sides for a sufficient depth equivalent to the thickness of beading desired. Since such a beading is flat-topped, and does not have to match up with any portion in the opposite mold block, it will be comparatively easy to reproduce this extra shape in the mold cavity.

In respect of flash removal, a very great advantage will be obtained, because the flat, open-top edge of the part may be finished on a smooth sanding belt and the component will not be required to pass through a trimming die at all.

Provision of such a beading will also usually greatly add to the appearance value of the finished article. It will be specially noted that this beading is, in effect, a quarter-circle in shape. This is the simplest form as far as mold matching is concerned. If a semi-circular beading were to be employed, half the form would have to be machined into the movable mold block as well, and therefore a critical matching requirement would arise. The flash would then be produced along the crest of the beading, and its removal would in all probability have to be effected by means of a trimming or shaving die of the kind mentioned earlier.

These two examples, representative of the application of beadings to improve surface appearance and reduce flash-trimming requirements, well illustrate the importance of a balanced relationship between their location and the parting-line surface in the mold. They also show in what manner flutings, grooves, etc., on the sides of a component should be located to ensure simplest flash removal.

The diagrams at Fig. 2 illustrate yet another very important type of parting-line layout for a mold which deserves mention at this stage.

Referring to the first example, shown at A, this is an outline view, in front and plan elevation, of a simple knob component. This member comprises a conical bossed portion having a spherical apex, and joined to one side of this member is the integral handle portion, by means of which the knob may be rotated by finger pressure.

The extreme left-hand side of the handle portion is formed semi-cir-

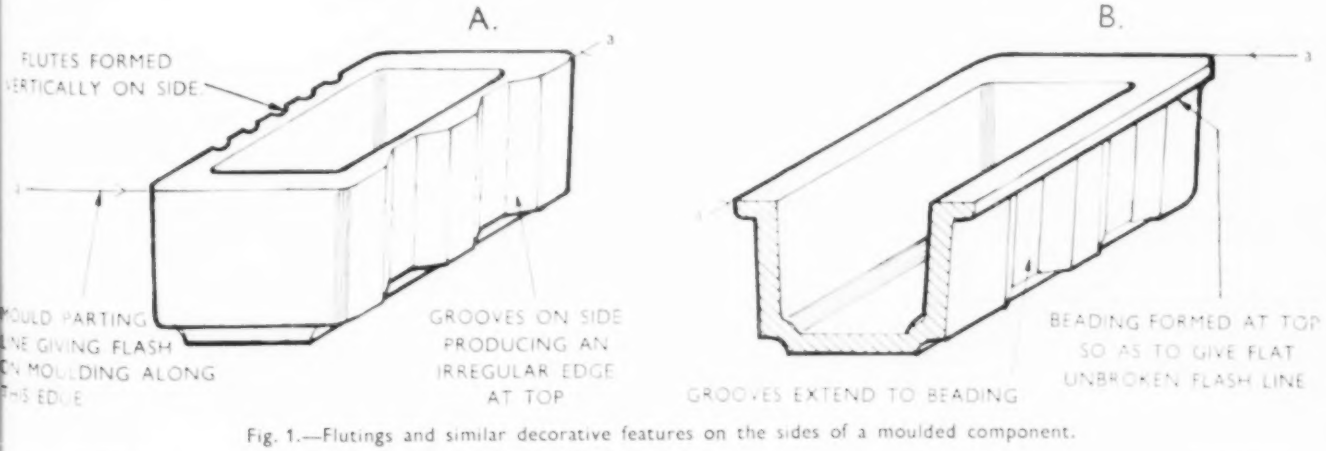

Fig. 1.—Flutings and similar decorative features on the sides of a moulded component.

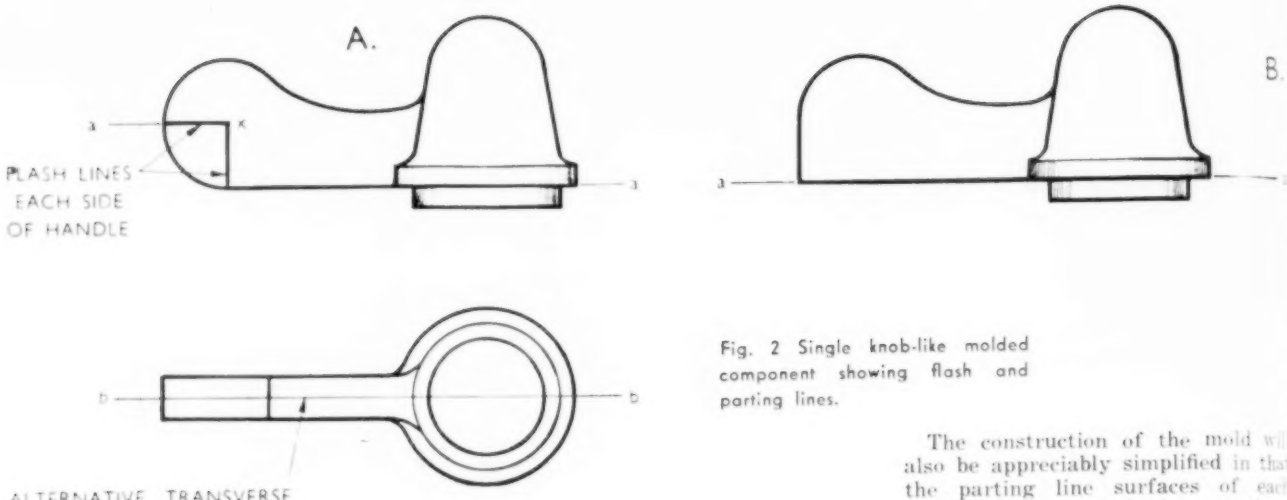

Fig. 2 Single knob-like molded component showing flash and parting lines.

ecular in shape, wherein lies the particular difficulty of parting-line location to be considered. To produce this part as a compression or injection molding would require the molding tool to be parted along the line "a—a," which plane passes along the flat base of the conical boss and straight portion of the handle up to the vertical centre line of the rounded end thereof. At this point the parting line lies at right angles to the former portion and extending up to the centre X, from which point the radiused end of the handle is located. Continuing from point X, the parting line then extends horizontially parallel with the first long straight portion to the end of the component.

Thus a stepped parting-line surface will be necessary in the mold, and these members would have to be accurately matched up, especially on the short vertical step passing from the base of the molding up to the centre point X.

On the finished component the flash line would therefore follow the line "a—a" just described, and the component would probably have to be finished on the sanding belt on the front and rear sides of the semi-circular portion of the handle to remove such flashing. This operation would embrace some risk of damaging the polished surfaces of the handle unless performed with extreme carefulness.

It would be possible, however, to reproduce this component from a mold parted in a somewhat different manner, but again certain disadvantageous features would arise.

For example, the parting line might be located in the manner shown in the lower plan view at A, which is denoted by the transversely situated line "b—b." With such a mold layout, each half of the molding beyond the line "b—b" would have to be machined into one mold block, and the two members correctly matched together to ensure perfect alignment of the two cavity portions throughout the entire perimeter of the component.

This would entail a considerable increase in the manufacturing operations involved in the mold production, especially in respect of the formation of the half-conical portions for the main-boss stem of the part.

The stepped form of mold parting will be necessary in order to ensure that the finished component can be extracted from the mold cavity during ejection. Should there be any slight error or discrepancy in the disposition of the short, vertical, stepped portion relative to the centre point of the semi-circular end of the handle cavity, denoted at X, the result would be to cause one portion of the cavity to be deeper or greater than a true quarter-circle. With such a condition the molding would probably tend to hang up in the cavity and considerable production delays might be experienced.

These and kindred difficulties may easily be avoided by adopting the very simple modification depicted at B (Fig. 2).

From this illustration it will be noted that the shape of the component is retained substantially the same as that of the previous example, with the exception that the semi-circular shape of the handle has been eliminated, and in its place a quarter-circular shape has been substituted.

The employing of such a shape as this will render it possible to have a perfectly straight and flat parting line in the mold. This is clearly depicted by the line "a—a." The flashings formed on the component will, therefore, be situated on the flat bottom edge of the part, being wholly confined to this point, and will not occur on the smooth flat sides of the handle, as is the case with the earlier example.

The construction of the mold will also be appreciably simplified in that the parting line surfaces of each block will lie entirely in one plane and they will be flat instead of stepped, thereby rendering the task of sealing them together very much easier.

No difficulties would be experienced in regard to the safe ejection of the finished moldings from the cavity area, as would be prone to occur in connection with the preceding example.

This article is reprinted by special permission of the English magazine "Plastics."

Alvis Barrier Joins Plastic Pipe Company

Gentlemen;

Effective December 1, 1952, Mr. Alvis L. Barrier will cease his active association with Barrier-Pribble. He will, however, maintain an interest and serve it in an advisory capacity.

Mr. Barrier's personal services will no longer be available to our clients. Our company will continue to render the same types of service which have found such a ready acceptance during the past 5 years. Our personnel has been expanded in anticipation of Mr. Barrier's release. We want to assure you with this direct communication that your problems will continue to receive the same expert attention.

For the past several months, we have been engaged as consultants to The Southwestern Plastic Pipe Company of Mineral Wells, Texas to assist them in setting up a new plant. Mr. Barrier will be General Manager of the new enterprise which will produce extruded plastic pipe and allied items for use in chemical industries.

We are sure that you will join with us in extending to Mr. Barrier best wishes for the success of this new enterprise.

Wayne Pribble

AROUND THE WORLD

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AUSTRALIA

AUSTRALIAN PLASTICS
Vol. 8, No. 84, July 1952

Abstracter: Albert Lightbody

PLASTIC SOLES FOR SKIS

Present championship skis have nitro-cellulose running faces. Their development in Europe has been traced.

PLASTICS NEAR FUTURE POLYSTYRENE:
William Schack

The phenomal expansion and the new types of polystyrene now in production with many of the large volume applications are discussed. This is a reprint from "Plastics Industry."

NEW SYNTHETIC FIBRE—ORLON

The production of polyacrylnitrile in West Germany is compared with that of other synthetic fibres, pointing out the large industrial advantages in production over Nylon, Perlon, Terylen, etc.

ADVANTAGES OF AUTONOMOUS AND AUTOMATIC MACHINES FOR THE INJECTION MOLDING OF THERMO-PLASTIC RESINS

The economic and quality advantages that accrue from the use of automatic equipment are discussed in this translation from the Italian "Materie Plastiche."

HISTORY OF BRITISH PLASTICS INDUSTRY:
British Directorate of Information

The development in Britain of all types of plastics materials beginning with celluloid and going through the phenol formaldehyde resins is covered in this article. The dates are given of the first appearances of such plastics as casein formaldehyde, alkyds, aminoplastics, methacrylics, polyethylene, polystyrene, polyvinyl chloride and synthetic rubbers and fibers. The organization of the plastics industry is similar to that in U. S. and falls into two groups, material producers and fabricators. The British Plastics Federation, the Plastics Institute and the High Polymers and Plastics group of the Society of the Chemical Industry comprise the professional and trade associations. Research in the industry is confined to individual efforts and not under a central research association as is usual with other British industries.

EXTRUSION OF ACETATE SHEET AND LARGE PIPE:
E. C. Blackard

This paper was presented at the 8th Annual SPE Technical Conference and discusses the design and control necessary for satisfactory production.

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FRANCE

INDUSTRIE DES PLASTIQUES MODERNES,
Vol. 4, No. 8

Abstracter: Hans Mayer

WHERE DOES THE INDUSTRIAL MANUFACTURING OF TEETH FROM ACRYLIC MATERIALS STAND?
Dr. C. E. Constant

A discussion of the advantages of acrylic teeth and dentures and a detailed description of the manufacture of teeth including designs of multi cavity dies and presses adopted for the purpose. The method recommended is plunger molding.

A PLASTIC CARTRIDGE FOR A 12 CALIBER HUNTING GUN:
R. Ghezzi

Description of the design of a transparent molded shell cartridge.

WHAT USE TO MAKE OF "COBEX":

Methods of fabricating and suggestions for profitable end use of "Cobex," a Vinylite Sheeting produced by BX Plastics Ltd.

GLASS FIBERS IN THE SERVICE OF PLASTICS:
M. J. Duplos

Types of glass fibre reinforcements, treatment of the material, applications.

AN APPLICATION OF PLASTICS IN METAL CASTING:

Metal castings of the "Lost Wax" method being made cheaper by using molded polyst. parts instead of wax in the sand form, burning the molded article after it has been surrounded by the sand and filling the empty space thusly created with the metal.

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GERMANY

KUNSTSTOFFE

Abstracter: Anne Schwend

These are the subjects the AUGUST 1952 edition of the "Kunststoffe" magazine deals with:

Dr. Karl Frey of Basle illustrates with the help of a few samples the variety of factors influencing the result of strength measurements which should be considered upon introduction of measuring prescriptions and new standards. Among these are homogeneity and isotropy of the plastic materials, proper shaping of the test specimen, possibly even diameter, elimination of finishing work on the test specimen, even and slow cooling of hot molded pieces, specimen of not too large a diameter in order to avoid even hardening (Switzerland has accepted a test rod of 4x10 mm in their standards), secondary treatment under limited heat influence, etc.

Dr. Engineer Cord Petersen, writing by order of the Plastics Testing Department of the Material Testing Institute at Darmstadt, reports about the development of a new apparatus for measuring the surface resistance of plastic materials, development which was undertaken in order to eliminate the deficiencies so far known to exist for the apparatus built on the basis of German Standards VDE (electrical standards) No. 0303 and DIN 57303 which had cutting electrodes of non-rigid rubber material coated with laminated metal. Each one of the cutters was replaced by 20 laminated springs of rust-proof steel of 5 mm width so that even highly curved articles would show contact at clearances of 5 mm at the maximum. Design and utilization of this device are described as well as the measuring results obtained from twelve different kinds of phenolic resins compared with the results obtained by using rubber electrodes and graphite electrodes.

Dr. Gerhard Schricker points out that the PATRA Tentative Standard Method of Test for Water Vapour Permeability of paper, cardboard, and other "sheet materials" for packaging purposes, which is widely known in

the United States and Great Britain, does bring results which deviate considerably from the actual permeability values. An accuracy of about 10% can only be achieved with some certainty at a restricted range of permeability, i.e. for materials having a permeability factor of 1 to 250 g/sq.m. by 24 hours. Since there are plastic foils having a permeability factor of 1 g/sq.m. by 24 hours and less, a method will have to be developed to measure the amount of diffusing steam directly, possibly by creating a protective atmosphere around the sample to be tested. Which one of the possible methods will be suited for standardization experience will teach as soon as sufficient comparative data is available. Does not indicate those ways possible more elaborately.

The addresses held at the convention of the working group "Plastics and Caoutchouc" in the Society of German Chemists, held at Frankfurt on Main in May 1952, are briefed and deal with the following subjects:

1. Prof. Dr. W. Skraup: About the formation of factis upon sulfurization and vulcanization.
2. Dr. H. Krebs: The performance of basic vulcanization accelerators.
3. Prof. Dr. Ueberreiter: The form of macromolecules.
4. Dr. H. Zahn: About the delicate structure of high polymers.
5. Dr. H. Orth: About the polymerization of non-saturated dioxolanes.
6. Prof. Dr. W. Kern: Kinds of formation of makromolecular materials through polymerization.
7. Dr. K. Hultzsch: About the context and fixing the limits for polyreactions.

Dr. Armin Ossenbrunner of Leverkusen gives a survey of the development and progress made in the production of cellulose acetyl films (safety film base) on the occasion of the conversion of movie films from nitro base to acetyl cellulose base with all large producers of film.

The Farbenfabriken Bayer at Leverkusen have started the production of a new pigment called "Helioecht-Carmin-B-Pulver" having an outstandingly clear, brilliant and bluish carmine hue. It is used for the production of graphic colors, dyes for the paper and tapestry industries, as well as for pigmentation of nitro-, resin- and oil lacquers and the dyeing of plastic materials.

Dr. Erich Escales of Wiesbaden describes the process of electro-statically coating plastic surfaces with textile fibres and other powdered materials, such as graphite, powdered metal as well as other organic or inorganic particles. The process itself, binders, flakes and devices used are enumerated and described.

Dr. W. Tischbein and Dr. G. Beck report about the first German tests made to impede the wandering of PVC plasticizers. In order to replace the polyblends of the B. F. Goodrich Chemical Company of Akron, Ohio, it was discovered and evaluated that certain synthetic caoutchoucs of the butadiene acrylnitrile polymers, with their outspoken insolubility, act as plasticizing components for polyvinylchloride. On the basis of this fact the Farbenfabriken Bayer at Leverkusen have developed new products called "E 244" and "Eukanol W," three-component polymers of butadiene, acrylnitrile and styrol. So far, they are on the market as a 40% aqueous emulsion of two different degrees of hardness. Mixtures of the polymer with polyvinylchloride do not exist up to date. The resin is practically insoluble in all solvents. Some esters do cause it to swell slightly. A diagram shows the results of mechanical values of rolled PVC foils which were manufactured

a. without adding nitrile caoutchouc
b. by adding emulsion "E 244" and "Eukanol W" and
c. by adding Latex Polyblend 550x20, a 45% acqueous emulsion of 55% PVC and 45% nitrile caoutchouc.

By adding Latex Polyblend which contains 55% polyvinyl chloride in emulsified form to foil materials the overall contents of ester plasticizer is reduced and the tensile strength of foils thus produced a bit higher than if they were produced with E 244 and Euokanol W. However, it is to be stressed that foils made by adding E 244 or Eukanol W did show a very high tensile strength in transverse direction to the rolling direction. It has not been stated as yet whether this fact is a result of the addition of styrol.

The article by Mr. Albert M. Stover of the Naugatuck Chemical Division of U. S. Rubber Co. about "Extrusion of vinyl film" in the February 1952 edition of SPE Journal is reprinted in condensed form.

New literature by German companies:

The Farbenfabriken Bayer at Leverkusen have issued a pamphlet about "Helioecht-Rottoner 3B," a red pigment, light, and heat-proof, which is insensitive against solvents, oil, plasticizers and does not wander. Used for the pigmentation of celluloid, polystyrene, pheno- and aminoplasts, lacquers, etc.

The Anorgana, Gendorf, issued a pamphlet about the production of hardly inflammable nitro- and acetyl cellulose combinations with trichloride phosphoric acid ester. — Another pamphlet deals with the types, properties and utilization of special PVC foils. — A third illustrated pamphlet shows various materials shaped as ribbons, foils and thread on the PVC base, in bright colours for interior decoration and artwork.

The Badische Anilin- und Sodafabrik at Ludwigshafen issued the following pamphlets:

1. "Palatinol K"—The properties of butylglycol phthalate as plasticizer for PVC.
2. "Weichmacher TS"—Properties and utilization of this plasticizer on sulfonamide base for supramides (polymides).
3. "Elaol 34"—Properties and utilization of this fatty acid ester as plasticizer for lacquers and plastic materials (PVC).
4. "Oppanol ORG Folie"—Forms in which this foil, a polyisobutylene mixture with fillers, is supplied, its properties and utilization for the protection against corrosion of metal containers, pipe lines, cement and wood containers, etc.

The "Armaturenfabrik Johann Fischer, Abt. Maschinenbau, Lohmar Bez. Koln" issued a prospectus about their new types of screw presses with screw diameters of 40, 50 and 60 mm.

The P. Leistritz Co. of Nuernberg describes their kneaders for homogenization, grinding and gelatinizing of plastics (machine has two counteracting screws).

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GREAT BRITAIN

PLASTICS INST. TRANS., LONDON Vol. 20, No. 41 (1952)

Abstracter: Harriman B. Dash

UNSATURATED POLYESTER RESINS:

B. Parkyn

The development of polyesters is traced from the simple linear type (glycol-phthalate),

to the present day unsaturated type:

—X—CH=CH—X—CH=CH—X—

where X represents the ester portion of the molecule in which either reactant can contribute the vinyl group. These unsaturated polyesters are heat convertible to cross-linked (thermoset) structures or can be modified by monomers (styrene, methacrylate, etc.) to yield thermosets at room temperature cures. The type and quantity of ester reactants and modifying monomers determine the end product. The polyester resins can be tailored to fit particular characteristics and this versatility has accounted for the wide interest in these resins. Their use has sometimes led to discouraging and seemingly inconsistent results. This has been traced to such factors as inhibition or acceleration of cure, heat dissipation and distribution, stress concentration, etc. These factors are well known and controllable today, so that these resins have in the years since the war seen real

acceptance in the surface coating, casting, and laminating fields.

Reinforced plastics, and in particular glass fibre based products, constitute the largest application of the polyester resins. The various types of glass base employed (continuous filaments, staple fibre, woven cloth, mat, etc.) and the properties of the glass-polyester laminates are discussed in some detail. High tensile strengths (up to 70,000 psi) are available, and on an equal weight basis these laminates approach the strength of some steels. Excellent summary descriptions of the various laminating processes are presented. These cover practically all of the methods in current use.

Mention is made of a recent interesting application of the use of chopped glass — polyester compound suitable for low pressure molding. It has been found possible to transfer mold such compounds and the obvious tooling economies over high pressure molding combined with the excellent strength obtainable should lead to their increasing use.

The ease of casting polyester resins in cheap molds has made their use very popular for small lot runs. Special casting uses (electronic components potting, specimen embedding, photoelastic stress models) are also discussed.

This paper is well worth the attention of those interested in a review of the applications of unsaturated polyesters and of the methods employed in their use.

FIBERS AND PLASTICS:
A. Renfrew

A brief historical sketch of the more common natural fibres (cotton, linen, silk, wool) introduces the subject. Synthetic fibres are spun into thin uniform filaments by one of three methods (wet, dry, or melt). It is common practice to first try continuous filament production in imitation of natural silk fibre with an approximate length of 1000 yards. For use as staple fibre the synthetics are cut into small lengths equivalent to those of the natural fibres. Crystallization and orientation for improved physical strength are introduced into the synthetic fibre by cold drawing. Mention is made of some of the techniques (X-rays, infra-red, density) employed for studying synthetic fibres.

Though not explicitly defined, the author uses the term plastics to designate high polymer products other than synthetic fibres. This many appear confusing to readers here, since products fabricated from synthetic fibres are generally known as plastics also. The methods of handling plastics are contrasted by way of mention with those for synthetic fibres (extrusion vs spinning, coloring vs dyeing, etc.) The word plastics could well have been omitted from the title as little else about them is discussed in the article. The author traces the development of various synthetic fibres produced in commercial quantities (cellulosics, proteins, glass, vinyls, amides, terephthalates). Some of the more recent developments have been overlooked (Dacron, Orlon, Fibre V, etc.) and very little is mentioned of fibre combinations (synthetic or natural). The paper can be recommended only as a brief introduction to the subject.

BRITISH PLASTICS, August 1952

Abstracter: Herbert R. Simonds

EDITORIAL

Interest in England is keen concerning a National College of Plastics Technology. Experience in the 2nd World War demonstrated the importance of applied plastics to the armed forces.

To correct this, a flow of technologists is needed and to achieve this, facilities for higher education must be improved. A National College would draw its students direct from schools and institutes. Such a college, were it established, would provide a focal point in the plastics industry and should prove of sufficient value to the nation to warrant further backing.

NEW FRONTIERS FOR PVC WELDING (7 pages illustrated)

During recent years the employment of a heat sealed seam in p.v.c. fabrication has shown rapid development. Various factors have contributed, most important of which has been development of types of p.v.c. sheet and film intended for heat sealing.

For maximum strength of such a sealed seam, the material must have uniform electrical properties and uniform thickness. When properly made the welded seam is stronger than the stitched type and is water-tight. In England leather is in short supply and finished leather goods are subject to a 100% purchase tax. Thus, manufacturers of leather goods are turning to the use of polyvinyl material with heat sealed joining. This is also true in the packaging industry where some firms are finding it worthwhile to install their own heat sealing machines. The cost of a heat sealing machine for small packaging runs up to several hundred pounds. For toys and inflatable items, some very ingenious tools have been devised for heat sealing. Also, much auxiliary equipment such as high speed cutting machines and specially cooled band cutters have been developed. When laid out carefully, as many as one hundred sheets of p.v.c. are cut at one time. Various items produced by electrical heat sealing are cited. One of these is the electric blanket thermostat manufactured by the Warm-Glow Co., Ltd., 1133 London Road, Leigh-on-Sea, Essex.

PRECISION MOLDINGS FOR THE TEXTILE INDUSTRY
by Alan Beecham, Manager, Plastics Molding Dept., Courtaulds, Ltd., Coventry. (5 pages illustrated)

To satisfactorily invade the textile industry, plastics molding must be of a very high degree of quality and accuracy. This in turn calls for a large use of the thermosetting materials and the use of compression presses.

At the Courtauld's plant all molding materials are pelleted or preformed in high speed preforming presses. An interesting process described is that of making spinning boxes, preforms of which approach closely to the design of the final box. For these a special grade of phenolic is used for a high mechanical strength as well as resistance to sulphuric acid.

Work that comes from the molding shop is inspected and then passed to "rough molding" stores. During inspection particular attention is paid to cracks and other defects. After this they are passed to the machine shop where the latest type of grinders and similar machines bring about the precise dimensions of the finished item.

Production of the spinning boxes runs to several thousand per week and is carried on by means of a roller conveyor production line.

GLASS FIBRE PLASTICS FOR DESERT OIL TANKERS (2 pages illustrated)

A new and apparently most successful application of glass reinforced plastics is found in the manufacture of tanks for transportation of gasoline through the desert country of North Africa. English and American manufacturers have cooperated but the article refers to tanks fabricated by Carl N. Bettle Plastics Corporation, Fall River, Mass. for the Arabian American Oil Company.

Each tank has a capacity of two thousand gallons to be mounted to a truck chassis. The tanks are made of American Cyanamid Co.'s Laminac polyester resin, reinforced with fibreglass mat. Steel tanks previously used weighed more than twice as much.

Tank production started with the cutting of the glass mat to pattern and spraying on these a coating about 1/16" thick of resin filled with pulverized Gelite and white Calco paste. On these are placed successive layers of mat, each sprayed with a special curing resin containing three different catalyzing agents that are activated at different temperatures ranging from 70° to 200°F. This gives a 3-stage cure, the final cure taking place when the two halves of the tank are brought together. This final cure is brought about by blowing live steam into the tanks.

PLASTICS APPLICATIONS (4 pages illustrated)

The following are some of the unique items described:

An **acid pourer** for fitting to vari-

ous types of carboys.

Acrylic roof lighting prevents cracking of glass skylights over base where heavy cranes operate.

Figure wheel — inlaid figures in acrylic wheel used on calculating machines.

T.V. Screens made of Cobex vinyl co-polymer material.

P.V.C. Gas Piping for industrial and domestic use. This is extruded over tempered steel spring.

MOLDING VALVE-HOLDERS IN PTFE (1 page illustrated)

This describes the use of polytetrafluoroethylene in the production of electronic tube holders. This material is not easy to mold but its electrical properties have made it commercially advisable for the Imperial Chemical Industries, Ltd. to market the material under the trade name of Fluon.

Specially built preforming presses are used to operate off a 200-lb/sq.in. air line. The preforming operation is carried out at room temperature and gives the molding its general outline. Preforms are sintered at a temperature of 360°C, after which they are passed to a coining press where at a temperature of about 330°C, the desired dimensions and imprints are secured.

ACRYLIC ROD USED IN RAILWAY CONTROL (1 page illustrated)

Piping Light through acrylic rods which heretofore has been used chiefly for decorative effects is now used to illuminate movement of trains on a panel board.

In view of the recent accident in England, their control practice cannot be taken as an example as the article was written before the accident.

PLASTICS, September 1952

Abstracter: Alfred T. Rexer

BOATS OF GLASS FIBRE LAMINATES:

A description of the method of manufacture of twelve foot dinghies by a no-pressure molding system using glass fibre mat bonded with cold-setting polyester resin. A boat is cured ready for removal from the mold every four hours. Other developments such as light-weight fuel tanks and water conduit pipe are briefly described.

H.F. WELDING OF HANDBAGS:
H. R. Stilton

The advantages of using H.F. welding in the manufacture of p.v.c. handbags is discussed. Accompanying photographs show the production of an all-welded handbag. Substances such as cellulose acetate, "Pliofilm", and fabric- supported p.v.c. are also easily welded with a machine capable of producing a 15-in. weld in 1½ seconds.

DRY COLOURING OF POLYSTYRENE

A detailed description of the latest developments devised by the Monsanto Chemicals, Ltd. for the dry-colouring of polystyrene, a process that has been in use in the U.S.A. It is accompanied by a table giving the names of a wide variety of colours, the proportions by weight in which they are used and the names of suppliers.

PLASTICS IN THE SERVICE OF MAN

A pictorial review of high- quality units molded or otherwise fabricated in Great Britain for use in railway equipment.

ORGANIC TIN STABILIZERS FOR VINYL PLASTICS:
H. Verity Smith

The author discusses the reasons for the degradation of chlorine-containing vinyl resins under the influence of light and heat, and details the properties of an "ideal" stabilizer. Dibutyl tin maleate and dibutyl tin dilaurate appear to be most favored although much attention is being paid to the preparation of proprietary stabilizers containing tin compounds in conjunction with other stabilizing materials, the price of the compounded stabilizer being cheaper. The article is accompanied by an extensive bibliography.

SILK SCREEN PRINTING ON PLASTICS

A description with photographs of the decoration or printing on articles manufactured from plastics by the silk screen printing process. With very simple equipment and unskilled labor, sheets, moldings, and fabrications can be effectively marked or decorated. Polythene articles are claimed to be printed very successfully.

NEW PRODUCTIONS

Descriptions and photographs of several new plastic articles produced in Great Britain.

THE DANIELS 250-TON TRANSFER PRESS

Photographs and drawings describe the workings of a conventional down-stroke prefilling transfer press, having an 18-in. diameter main ram and two 4-in. diameter return rams, giving closing and opening loads of approximately 250 and 25 tons respectively.

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HOLLAND

PLASTICA, Vol. 5, No. 8

Abstracter: W. P. terHorst

APPLICATION OF HARD POLYVINYL CHLORIDE:
W. L. Essed, pp. 240-245
(Continuation from February, 1952 and June, 1952 issues)

The application of hard PVC in apparatus such as measuring instruments, pumps, reaction vessels, filters, ventilators, galvanic instruments, is described. PVC replaces metals and other construction materials and is of interest because (a) it can be shaped by means of heat (optimum temperature 130°C.) and (b) it can be welded.

A plasticizer can be employed which volatilizes during the welding operation, at temperatures of 140° to 150°C.

PARTIAL REVIEW OF MODERN CELLULOSE RESEARCH:
P. H. Hermans, pp. 257-260
(Continued from the July, 1952 issue)

It is surprising and, in a way, disappointing to the investigator that the content of crystalline cellulose is constant for all kinds of rayons of widely varying technical properties. The conclusion to be drawn is that the amorphous regions are more important to the technical properties of rayon than the crystalline regions and that future research must be concerned with amorphous cellulose.

PLASTICA, Vol. 5, No. 9

SOME APPLICATIONS OF POLYVINYLACETATE:
R. deBoer, pp. 275-278

The properties of Polyvinylacetate are enumerated; good adhesion to various materials is its most important characteristic, whether used in solution or emulsion. The use of an emulsion as a glue for woodworking, book binding and heatsealing is discussed.

TURBIDOMETRIC TITRATION OF SOLUTIONS OF HIGH POLYMERS
A. Oth and J. Bischoff

Turbidity titration of polymer solution is a new method of obtaining information about polymers. The method consists of adding percipitant to a dilute solution of the polymer and measuring the turbidity. In this paper, the experimental technique is described. Some results on nitrocellulose and cellulose acetate are given.

Turbidity titration is a rapid method of determining solubility curves.

★

UNITED STATES

Abstracter: W. W. Birdsmith

Selecting Special-Property Organic Finishes, A. L. Alexander.
Electrical Manufacturing, August 1952

Plastics based coatings and finishes are considered primarily from the standpoint of use in electrical equipment. The properties and applications for the following coatings are discussed; polyethylene, polytetrafluoroethylene, polytrifluorochloroethylene, epoxy resins, the various silicones, and silicone-alkyd folmulations.

SECTION NEWS

Edited by
Stanley
Bindman

Engineering and Cost Factors in Mold Building; Molding in Europe, Talks at N. Y.

A. M. Merrill

Two talks on "Engineering and Cost Factors in Mold Building" featured the October 15 dinner meeting of the New York Section. A near-record turn-out of 100 members and guests attended the meeting which was held at the Gotham Hotel. Featured speakers were director Saul Blitz, Noma Electric Corp., and president Bruno E. Wessinger, Wess Plastic Molds, Inc. As an added feature, there was also a short talk on "Molding and Moldmaking in Europe" by Harry L. Meklembourg, Progressive Plastics Mfg. Co., recently returned from an extensive trip abroad.

Speaking from the viewpoint of the injection molder, Mr. Blitz emphasized that as long as we use machines that have tremendous molding and clamping pressures, we must build molds strong enough to withstand these pressures. The real profit for a molder lies in making substantial molding runs, not in savings on the initial mold purchase price. The most economical mold is one that continuously produces acceptable parts in the shortest time with minimum maintenance, operator skill, and machine set-up. Such a mold is the result of proper engineering by the molder and moldmaker.

Upon receiving a sample or drawing of a proposed new part, the molder should give due consideration to possible methods of molding the part, further simplification of the part, the molding material to be used, the expected tolerances, the function of the part, the acceptable quality, and the expected production during the first year. The molder must also decide on the number of mold cavities after considering his machine capacity, the material to be used, and the surface area of the part. At this stage, the molder is ready to select a moldmaker, bearing in mind that most moldmakers specialize in a certain type of mold or mold construction.

After selecting the moldmaker, the molder should then discuss with him the type of mold, parting line, gate location and dimensions, ejection method and location, type of sprue bushing, cold slug and runner dimensions, cooling patterns, venting location and mold construction material. The speaker stated that selection of the mold material should properly be the responsibility of the moldmaker. Since the molder must live with the mold, it is up to him to supply the moldmaker with as much information as possible. A mold that hangs up during ejection for as little as two seconds in a 30-second cycle can cause an eight-hour production loss in one week.

Mr. Blitz also pointed out that many molders tend to shy away from the unconventional injection mold, and said that there is much to be learned from the die casting industry with regard to complicated molds. Properly designed cam molds, air cylinder core pulls, and unscrewing devices can save money for both molders and their customers, Mr. Blitz emphasized, illustrating this point with samples of molded parts.

Mr. Wessinger discussed the subject from the viewpoint of the moldmaker. Some of the points he mentioned were the need for meeting molders' requirements; the need for a sample of the mold to use in providing quicker, more accurate estimates of building costs than obtainable with drawings; the different mold construction materials and their uses; the effect of tolerance and mold polishing on mold costs; and the need for building the mold to suit the particular material to be used.

Mr. Meklembourg stated that compared to the United States, the plastics industry in Western Europe is still in its infancy. With the exception of England, France, Germany, and Italy, plastics molding is practically non-existent. About half the injection machines in use are of the old, hand operated type, and a machine of eight-ounce capacity is considered very large. In France, most injection molders have two or three machines with a total capacity of about 15 ounces. Molds are of the one- or two-cavity type; there are no cast molds in use; and little mold hobbing is employed. Mold building costs are 50-60% below those in the United States because of very low labor costs. The speaker emphasized that having molds built abroad is a very hazardous undertaking because of metric system usage, the need for samples of the product, the need for minutely specifying all mold construction elements, and the virtual impossibility of obtaining replacements quickly or cheaply in this country.

In the business session preceding the talks, a report on the recent meeting of the Society's national directors was given by Stanley Bindman, Jamison Plastic Corp. Mr. Wessinger announced that the Section's Prize Paper Contest will be handled by George Baron, Ideal Plastics Corp. Mr. Wessinger also appointed the following nominating committee to select a slate of candidates for Section directors: G. Palmer Humphrey, RC Molding Co., chairman; Richard M. Thews, Monsanto Chemical Co.; Samuel S. Stone, Nordan Plastics Corp.; Herbert J. Weber, Waljohn Plastics, Inc.; and Guy Martinelli, Sylvan Plastics, Inc. Mr. Wessinger and secretary-treasurer Arthur L. GeWert, manufacturers representative, are ex-officio members of this committee.

Table favors were distributed through the courtesy of R. F. Berentsen and Rohm & Haas Co. The meeting closed with a drawing for four door prizes contributed by Harold Schwartz, Empire Brushes, Inc.; Mr. Blitz; and Nicholas V. Fasano, Washington Molding Co., Inc.

George J. Wexler, DuMont Electric Co. and member of the New York Section, is now in Italy as a member of the Special Mission to Italy for Economic Cooperation of the Mutual Security Agency. An authority on capacitors and resistors, Mr. Wexler is a member of a 10-man team on experts sent by MSA to assist in developing Italy's production.

Dusal Tool & Mold Co., 241 Centre St., New York 13, N. Y., is expanding into additional quarters at 37-01 Vernon Blvd., Long Island City, N. Y. The new facilities comprise 12,000 square feet of space to give Dusal a total of 18,000 square feet of area. New equipment is being installed to enable the company to greatly expand its moldmaking and other services.

Connecticut Sees Films and Asks Questions at Panel Discussion

David Mersey

The second 52-53 meeting of the Connecticut Section was held at Bridgeport on October 10. Forty members and guests were present.

The first portion of the meeting was occupied with the Jones and Lamson Company's film, 'What's the Difference.' This movie gave the complete story of inspection with the optical comparator—from 'comparison' to 'precision measurement.' There were a number of actual production scenes showing the inspection of both flat and curved surfaces. In the plastics industry there would seem to be many applications for this instrument: in the inspection of multiple cavities and forces; as a means of following tool wear or erosion; as a continual spot-check of molded parts during production. This would lead to a reduction of rejects and scrap; and the prevention of shutdowns caused by the sudden discovery of tools worn beyond allowable tolerances.

In the annual panel discussion which followed, the judges were: Charles Smith of Bryant Electric Co., William Smith of the Waterbury Companies, and Fred Sorenson of American Cyanamid Co. They awarded three prizes of five dollars for the best questions submitted. They went to E. E. Tevis, Monaplastics, for, 'What is the best way of avoiding bubbles in the injection molding of transparent, heavy sections?' James Wheeler of A and W Tool Co., asked 'Will the pipe-line system of runners work on any type of plunger-transfer-mold? David Mersey, Multiplastics, wanted to know . . . 'In the light of recent applications of rubber to phenolic and styrene compounds, and phenolic to rubber, is there still a difference between thermosets and thermoplastics?'

Twenty-six questions were submitted, seven on materials, and nineteen on tools and techniques. There were two questions on nylon: one on shrinkage control; the other on optimum nozzle diameter. Also an inquiry about glass-filled phenolic material. Someone raised the question on how to prevent cylinder corrosion caused by the long use of butyrate compounds.

In the field of tools, questions were submitted, asking about copper beryllium cavities; correction of the movement of the force in deep raw molds; molding of threaded parts; center as against edge gating; mold design for cylindrical parts.

"Local Spotlight" shows Philadelphia Industry Varied and Important

Adolph Kissileff

Philly's October Meeting, held as usual at Franklin Institute, witnessed an innovation that could well be adopted by all sections.

The evening was devoted to discussions by members of the district. The effort will be repeated each year under the title — "The Local Spot Light." Four speakers were selected, each from a different phase of the industry.

Speakers at this meeting were J. Gordon Seiter, representing F. J. Stokes Machine Co. Seiter presented an interesting story on High Vacuum Metallizing. Using a combination of slide film and actual finished products, Seiter illustrated how the applied basic methods of metallizing can very easily send this infant process into a skyrocketing industry.

Joseph M. Hoopes, of the Synvar Corporation followed with an address bearing on the processing of wood wastes into resins for almost every use. Samples of plasticizing were displayed and received with considerable enthusiasm.

From Synthane Corporation, Dr. Norman Skow gave a very entertaining history of his company, outlining the steps in its growth, and including humorous quips about some of the problems encountered in the process of developing various materials.

The final speaker, Adolph Kissileff, President of Amplex Manufacturing Company used as his subject the development of a proprietary item. Kissileff stressed the importance of selecting the right material to assure the success of the item, and pointed out examples of public reactions to misapplied materials.

George Koch, local President of SPE announced that Philadelphia would play host to the National Conference in 1955, advising that headquarters will be selected before the end of November. Koch also requested news items for the newly launched local monthly gossip sheet, inviting members to use it for the exchange of information interesting and useful to Philadelphia members.

The title of the publication is PHILADELPHIA PLASTICS PRESS and will be edited by Adolph Kissileff, local Publicity-Chairman.

The December meeting, as usual, will be Ladies Night. Dinner will be at the Dairy Dell and Dick Fosbo promised an entertaining evening highlighted by outstanding speakers.

Ole Olsen of Hercules Powder due to job reassignment has resigned from SPE board and Adolph Kisseleff has been appointed in his stead.

Patent Law Trial To Be Toledo Program

Robert DeBrock

The Toledo Chapter of SPE was host to their ladies at their October meeting which was held on the evening of October 22. The program was planned in a lighter vein than usual with special attention to a program which would appeal to the ladies.

Cocktails and dinner were served at the Heatherdowns Country Club, and special favors were presented to the guests. After the dinner, all those present retired to the lounge where door prizes were awarded to those holding the lucky tickets.

Mr. John Purdue, of the Toledo Patent Law Association, extended an invitation to the chapter to attend a mock trial on patent interference. This should certainly prove to be interesting to a large number of the plastic manufacturers inasmuch as from time to time they may become involved in patent applications or other types of patent problems. The main speaker of the evening was Mr. James Shelnutt, of the DuPont Corporation, Products Information Department, who is well versed in the application of synthetic fiber materials such as rayon, nylon, orlon, and the likes. Mr. Shelnutt punctuated his discussion by showing various garments made of synthetic materials, which were of great interest to the ladies present. He concluded his talk by a question-and-answer session.

NEWS OF THE SPE SECTIONS AROUND THE NATION

Cost Reduction Topic At R. I. & S. E. Mass.

John R. Sloane

The Rhode Island and Southern Massachusetts Section of SPE held its October 9th dinner meeting at Wayland Manor, Providence, R. I. A large attendance of members augmented by some eighteen or twenty guests made it necessary for the hotel to bring in extra tables and chairs for the dinner.

President Robert J. Feuchter gave an inspiring talk on SPE and the matter of maintaining high standards of membership in the Society. Mr. Feuchter announced the election of two new members, William J. H. Dyer of Anchorage Plastics Corp., Warren, R. I. and Stanley C. Dusza of Cornel Dubilier Electric Co., Providence, R. I.

Emil Kleiner of General Electric Co., Membership Chairman, has been doing a splendid job in the matter of new members, and the goal of 70 members for this section by the end of the year appears well on the way to accomplishment.

Following the dinner, Mr. Feuchter introduced the speaker of the evening, Mr. John L. Schwab, President of John L. Schwab and Associates of Bridgeport, Conn. Mr. Schwab took for his subject "Methods Engineering and Cost Reduction" particularly as it applied to the Plastics Industry. He has been an outstanding figure in industrial engineering for the past several years. An expert in the field of manufacturing, production, and management engineering, Mr. Schwab has in the past ten years installed these procedures in virtually every type of industry in the Eastern and Mid-Western area.

This was the 499th lecture that Mr. Schwab has delivered to almost every type of professional society. His wide experience in an advisory capacity has caused him to serve such concerns as DuPont, General Electric, Westinghouse, Bryant Electric and many others. Following Mr. Schwab's interesting lecture a long question and answer period brought forth much interesting discussion.

Automatic Mold Machinery Talk At West New England

E. J. Sweeney

The Western New England Section held their first dinner meeting of the 1952-1953 season on October 1, 1952, at the Hotel Sheraton in Springfield, Massachusetts.

After the usual door prize drawing and introduction of guests, John Mallory, Section President, reported on the work the Section is doing for the 1953 National Convention at Boston.

Mr. E. Vail, Chairman of the Nominating Committee, explained the ballot to be used in voting for directors. George Martin, Secretary of the Section, stressed the importance for members to return the meeting reply card promptly.

This first meeting of the season was well attended and the Program Chairman, Mr. E. Childs, has also scheduled interesting programs for the November and December meetings.

The subject for the evening was "Latest Developments in High Speed Automatic Molding Machinery". Mr. Quentin White of the F. J. Stokes Machine Company discussed thermosetting equipment, and Mr. Fred Means of the Fellows Gear Shaper Company, spoke on thermoplastics machines. Both speakers were thoroughly familiar with their subject, which prompted a great deal of discussion and questions from the members.

Plastic Pipe Use In Australia Is Shown At East New England

Robert C. Davenport

John Marvin opened the fall season of SPE-SPI meetings with a beautiful series of colored films on Australia as background for his talk on "Plastic Pipe—a Growing Field." Those of us unfamiliar with the land down under had quite a treat exploring a country as yet little revealed to outside peoples. The third film, "The Piping of Water — Australia's Lifeblood," most aptly illustrated Marvin's talk.

Scenes showing the Tenite pipe being installed and used for conducting water for agriculture were most interesting. Laying the pipe underground was simplified by attaching one end to a plow and towing it into position, below the surface. The pipe may be readily cut into for outlets or joined with cemented slip sleeve connectors making it easy and fast to work. Other uses of Tenite pipe are for conducting drinking water, beer, fruit juices, the drainage of wounds in surgery, etc. An additional film was devoted to its use in oil fields where its resistance to salt water, sour crude oil, acid and alkaline earths, and paraffin deposits have made it an improvement over iron pipe.

The discussion period brought out the uses of other materials for piping, such as modified polystyrene, vinyl (both flexible and rigid), polyethylene, and glass filled polyester. It also demonstrated the advantage each material had in certain fields of use. Samples of Tenite pipe from a fraction to four inch diameters with molded and fabricated joints, tees, and ells were examined with much interest after the talk.

This meeting of the Society of Plastics Engineers, held joint-

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November, 1952

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Yours for better living with plastics
Wayne Pribble

East New England

(From page 25)

ly with the SPI, was held at the Beaconsfield, Thursday, September 25th. The preprendial hour began at 6:00 P.M. followed by a turkey dinner. About 65 members and guests joined together for this first meeting of the fall. James F. Lang, President of the local section, SPE, opened the brief business sessions with the announcement that our section counts over 100 as members or in process.

The next session was Thursday, November 13th, in a meeting sponsored by the Boston Providence chapter of SPI. No meeting was held in October because of the SPI New England Regional Conference in Manchester, October 16th and 17th.

This summer has seen several meetings of the Technical Conference Committee. The feature speaker has been selected and dates and places are being nailed down. The Committee has lost Sylvan S. Simon, Van to us, to New York, where he has gone on a new job. Your correspondent will take his place as Speakers' Committee Chairman.

We are getting closer to the Ninth Annual Technical Conference of SPE to be held at the Hotel Statler, January 21st, 22nd and 23rd. Remember Conference of SPE, to be in Boston '53.

Indiana Enjoys Flight to the Future

Philip A. Leonard

The first meeting of the 1952-53 season of the Northern Indiana Section of the Society of Plastics Engineers, Inc. was called to order by Mr. Ferris Newman, President, on October 3rd, 1952 at 8 p.m. in the Chamber of Commerce Building, Fort Wayne, Indiana.

There was a general discussion held on the next meeting of the Section and it was decided that we should investigate the possibility of having announcement cards printed for this meeting to be distributed to the members for distribution to their friends and customers.

In view of the absence of Mr. Frank Butters, our present program chairman, Mr. Ferris Newman, was appointed the new Program Chairman.

An informal dinner was held at Manochio's Grill & Restaurant preceding the meeting.

The program for the evening included a movie "Flight to The Future" which was produced by the Bakelite Company and the general discussion was led by two technical representatives of the Bakelite Company, Mr. Richard Smith and Mr. Ray Richards.

An attractive door prize, a Lucite hair brush, was donated by the local section.

700 ATTEND CLEVELAND-AKRON SPE JOINT MEETING WITH AKRON RUBBER GROUP

Frank A. Martin

The Cleveland Section held a joint meeting with the Akron Rubber Group on October 17, at the Mayflower Hotel in Akron. Nearly seven hundred members of the two organizations attended this meeting. The afternoon program featured a symposium on "Vinyl Compounding and Processing." Previously solicited questions were answered by the panel of members, as well as a number of questions submitted from the floor.

The panel consisted of Mr. J. C. Richards, of B. F. Goodrich Chemical Company, who acted as moderator; Mr. K. K. Fligor, Goodyear Tire and Rubber Company; Mr. R. A. Mansfield, B. F. Goodrich; Mr. Frank Steere, Steere Enterprises; Mr. B. K. Lyckberg, Firestone Plastics Division; Mr. Dan G. Siddall, U. S. Stoneware; and Mr. F. A. Martin, The Hoover Company.

Numerous questions on all phases of the vinyl industry including compounding, extrusion, molding, calendering, and plastisols were capably handled by the panel members.

Following a social hour the group reassembled for dinner, at which time Mr. W. F. O'Neil, President of General Tire and Rubber Company gave a very thought-provoking speech on "Rubber, Plastics, and The Future."

This was unquestionably the best local meeting of the Cleveland Section. Arrangements for the meeting were handled by a joint committee consisting of W. H. Nicol, George Field, Phil Courtenay, Henry Rose, Larry Baker, Bud Behney, and V. L. Peterson.

The annual Christmas Party will be held on December 11 at Aurora Inn. This is the social highlight of the year for the ladies. The party is being arranged under the Chairmanship of Ward Van Orman, who is assisted by Syl Caldwell and Cliff Sauerwein.

S. E. Ohio Discusses Preplasticizing

Paul M. Smith

The October meeting of the Southeastern Ohio Section of the Society of Plastics Engineers Inc. was held at the Berwick Dining Room in Cambridge, Ohio, October 23 at 7:30 P.M.

Business meeting was opened by the president and the secretary and treasurer reports were accepted. The president announced that a directors meeting will be called to appoint a nominating committee and ballots will be prepared for the election of officers at the December meeting.

The program chairman Mr. J. W. Knight introduced the speaker Mr. R. W. Powell of HPM of Mt. Gilead, O., who gave an interesting discussion on preplasticizing the molding material before it entered the injection ram and the improvement in stress strains in the molded part. His discussion was illustrated by slides and samples of parts molded by this method.

Buffet lunch was served to 34 members and guests.

Molding Machines Are Detroit Topic

Emil Gazdick

On October 17, Mr. E. Gaspar, Diplomatic Engineer, A.M.I. Mechanical Engineer, gave a talk on the members and guests of the Detroit Chapter of the SPE.

The talk followed a dinner meeting held at the Rackham Memorial Building.

Mr. Gaspar is Chief Designer of the Projectile and Engineering Company, Ltd., London, England. Mr. Gaspar is responsible for the design and development for the full range of their injection molding machines, die cast machines, and special machinery.

In his talk, Mr. Gaspar discussed the features influencing the performance of injection molding machines such as shot capacity, plasticizing capacity, injection pressures, maximum rate of injection, locking pressures, maximum platen area and mold closing stroke.

We are greatly indebted to Mr. Gaspar for an excellent presentation of a subject of vital interest to all plastic men.

Chicago Sees Film On Plastic Pipe

M. A. Self

The October 8 meeting of the SPE in Chicago was attended by over 80 members and guests. The group enjoyed the color film sponsored by Tennessee Eastman. The film opens by showing the dependence of Australian industry and farming on water. It ends by showing how irrigation is being carried on through the use of Tenite pipe. The picture was of particular interest to extruders but much enjoyed by everyone.

Jack Bent, of Tennessee Eastman introduced the film and has advised that the film is available for other showings by making arrangements with any of the Tennessee Eastman Sales Offices.

Buffalo Hears Elliott On Impact Styrenes

R. H. Rushmer

The monthly meeting of the Buffalo Section of the Society of Plastics Engineers was held in the Hotel Sheraton on Friday evening, October 17. Dr. Paul M. Elliott, Manager of Kralastic and Vibrin Development, Naugatuck Chemical Co., Naugatuck, Connecticut was the guest speaker.

Dr. Elliott's subject, "High Impact Styrenes and Copolymers" was a discussion of recent developments which have led to materials of markedly improved impact, chemical, and heat resistance. Tables were projected showing the physical characteristics obtainable from these newly developed copolymers. Following the address Dr. Elliott answered a variety of questions on processing of these materials, their physical properties, and their chemical background.

Also discussed during the question and answer period were the characteristics of the polyester type materials.

Dr. Elliott's broad experience in the fields of both rubber and plastics resulted in an outstanding and highly informative program.

PLEASE NOTE

Amended By-Laws of

SPE

Third Column This Page

Effects of Humidity

(Continued from Page 13)

laminate, were folded over and held in place with paper clips. The lay-up was placed between preheated glass plates and the assembly placed in a laminating press or a circulating-air oven, depending upon the molding cycle used. (See molding conditions.)

Molding and humidity conditions— To determine suitable molding cycles, duplicate panels were molded at 265°F for 1 hour, at 250°F for 1, 2, and 3 hours, at 220°F for 1.5, 3, and 8 hours, at 160°F for 24 and 48 hours, and at 160°F for 48 hours, with an additional cure at 250°F for 2 hours. The fabric used in making these panels was oven-dried for a period of 1 hour at 275°F and the resin coating was done at a humidity of 4 to 8 percent. On the basis of flexural-strength data, three molding cycles were selected as suitable. These were 160°F for 48 hours, 220°F for 3 hours, and 250°F for 2 hours. To determine the effects of humidity during fabrication on this type of laminate, panels were molded at these three molding cycles and at five different conditions of humidity. These conditions of humidity were as follows:

In condition A, the fabric was oven-dried for a period of 1 hour at 275°F and was resin-coated at a low humidity, 4 to 8 percent.

In condition B, the fabric was dried over silica gel for at least 1 week before being coated with resin. In this condition, the fabric was coated with resin at the same low humidity as that in condition A.

In condition C, the fabric was conditioned over silica gel as in condition B. The coating of the fabric with resin was done at 45- to 50-percent relative humidity.

In condition D, the fabric was conditioned over silica gel as in conditions B and C. The coating of the fabric with resin was done at 95- to 100-percent relative humidity.

In condition E, the fabric was conditioned at 95- to 100-percent relative humidity for a period of 16 to 24 hours. The coating of the fabric with resin was also done at 95- to 100-percent relative humidity.

Triplicate panels were fabricated under each combination of molding cycle and humidity conditions B, C, D, and E. Only single panels were fabricated at condition A and the three molding cycles, since duplicate panels had already been made at these combinations of conditions in determining suitable molding cycles. The pressure used in molding all these panels was 0.7 psi.

Duplicate or triplicate panels were also fabricated at a pressure of 2 psi for conditions A and B at the three molding cycles, and for conditions D and E at a molding cycle of 220°F for 3 hours.

Operation of molding apparatus — The press used was a 10-ton hand-operated Carver laminating press, Model No. 126, equipped with a steam-heated platens and a steam-pressure control valve to regulate the temperature. Temperatures were checked with a mercury thermometer placed in a well in one platen and were maintained to plus or minus 1° C.

Amended By-Law Passed By SPE National Council Now In Effect

ARTICLE IV—FEES AND DUES
Part 4—B-17

Bills for annual dues of members shall be sent from the National Office by first class mail between June 1 and June 10. Dues are payable on or before July 1. Any members whose dues are not paid by September 1 shall be posted as delinquent by the National Office. The National Office shall send such members a notice of their delinquency by September 10 and at the same time forward to the officers of each section a list of their own delinquent members, and to the National Directors a complete list of all delinquent members. If the annual dues are not paid by October 1, a delinquent member shall become a member not in good standing and forfeits his rights to receive the Official Publication, to vote in section or national elections, and to hold office in the section or national organizations. By October 10 the National Office shall mail by first class mail to the Section Secretary a list of that section's members not in good standing and mail a complete list to the National Directors. Any member not in good standing who pays his dues during the fiscal year in which he was posted as not in good standing shall have his full rights restored and shall become a member in good standing for that fiscal year.

At the end of each fiscal year the National Office shall submit the names of all members not in good standing to the National Council for action on deletion of the members' names from the rolls of the membership. The delinquent members and the section secretaries shall be notified by the secretary of the action taken by the National Council.

RAINVILLE GOES TO MANCO

Dewey Rainville, former sales manager of Ball and Jewell, Inc., has announced the opening of manufacturers' representative offices in Garden City, New York. He will become metropolitan New York district representative for Manco Products, Inc., producers of TRU-CAST Beryllium Copper Cavities and Cores for the plastic industry, Mevindale, Michigan, as of November first.

Mr. Rainville replaces **G. Palmer Humphrey**, former Manco representative, who has accepted the position of vice-president and sales manager of R. C. Molding, Inc., custom injection molders of New Hyde Park, New York.

JOURNAL

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New Books

Maleic Anhydride Derivatives by Flett and Gardner; published by John Wiley & Sons, New York; 269 pages, $6.50.

One hundred sixteen types of chemical reactions of maleic anhydride are presented in this book in unique fashion. Each reaction occupies two facing pages, the right hand page gives the type reaction, general chemical equation, general procedure and a list of references, while the facing left-hand page gives a specific example, a discussion of the reaction, nature of product and reported uses.

The reactions are divided by chapters as follows; reaction with hydrocarbons, with halogens, hydrogen, metallic compounds, nitrogen compounds, oxygen compounds, and sulfur compounds. There is an introduction to each chapter.

The best way to describe the purpose of the book is to quote from the preface; "It is written particularly for the busy investigator—who likes to browse through chemical reactions looking for thoughts to stir his creative imagination."

The book is well written and the references are complete enough to be of real use in discovering the literature on each reaction.

This book is highly recommended for odd-moment browsing by anyone connected with development or improvement of plastics, resins, fibers, paints, oils or varnishes.

J. H. Day

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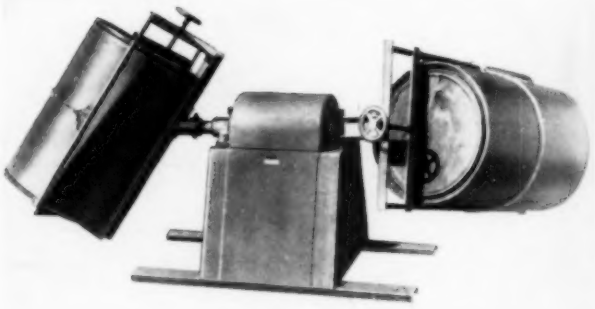

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